

RAND

*PACER SHARE
Productivity and
Personnel Management
Demonstration*

Third-Year Evaluation

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*National Defense
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Demonstration*

Third-Year Evaluation

*Bruce R. Orvis, James R. Hosek,
Michael G. Mattock
with Rebecca M. Mazel, Iva S. MacLennan*

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Assistant Secretary of Defense
(Personnel and Readiness)*

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PREFACE

This report describes the PACER SHARE Productivity and Personnel Management Demonstration and the plan that has been developed to evaluate it. The report also presents statistical results concerning the quality of work life, organizational flexibility, work quality, and cost savings during the baseline period prior to the demonstration and throughout the demonstration's first three years.

PACER SHARE is a five-year demonstration being conducted at the Directorate of Distribution (DS) within the Sacramento Air Logistics Center (SM-ALC) under the legal authority of the Office of Personnel Management. Its purpose is to determine whether several changes in federal civil service practices being tried on an experimental basis will improve organizational productivity, flexibility, and quality of work life, while sustaining (or improving) the quality and timeliness of work and the capability to mobilize during emergency or wartime. The DSs at the four remaining ALCs (which perform similar functions) serve as the comparison sites. The demonstration formally began in February 1988 after several years of planning. If effective, the interventions will subsequently be considered for wider application.

RAND was responsible for designing the external evaluation of the project's results and for carrying out the evaluation during the first three years. These results should be of interest to the wide audience concerned with the improvement of the workplace within the public sector.

The study was funded by the U.S. Air Force through a special arrangement with the Office of the Assistant Secretary of Defense (Personnel and Readiness), the research sponsor. It was carried out

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SUMMARY

The PACER SHARE Demonstration Project is a five-year federal civil service demonstration being conducted within the Directorate of Distribution (DS) at the Sacramento Air Logistics Center (ALC), under the legal authority of the Office of Personnel Management. In broad terms, the goals of PACER SHARE are to increase the flexibility of the organization to respond to changes in workload; to enrich the quality of work life; to maintain the quality and timeliness of work as these changes are being brought about and, in the long run, to make quality and timeliness even better; and to enhance productivity. The demonstration is designed to attain these objectives through several innovations in personnel practices and through productivity gain-sharing, which returns one-half of cost savings to the work force. The personnel system changes include job series consolidation; revised base pay determination, including pay banding and elimination of individual performance appraisal; supervisory grading criteria changes that emphasize job responsibilities and deemphasize number of subordinates; and Demonstration On-Call (DOC) hiring authority, which provides for rapid employee release and recall. Results in achieving PACER SHARE's goals are reported through spring 1991, after three years of the demonstration.

The improvement of organizational flexibility and quality of work life is measured through a series of survey and hard data (nonsurvey) measures. First, attitude changes among DS workers are measured in extensive annual surveys of the work forces at Sacramento and the other ALCs. Second, a battery of hard data measures addresses other changes. These measures are drawn primarily from the automated civilian personnel system. For example, we look at supervisor

staffing levels and instances of multiple skill training to assess organizational flexibility and at turnover rates to address quality of work life.

Quality and timeliness of work are addressed through an evaluation of command-directed measures, including data on error rates maintained by the Quality Division of DS, reports of discrepancies, and measures of timeliness and support maintained by the Management Division. Finally, we assess changes in productivity by measures of personnel costs relative to output. The method we use is based on statistical estimates of the changes over time in personnel costs at Sacramento and the other ALCs, controlling for changes in output. This method produces generally similar results to the method used by DS at Sacramento to determine gainshares. Estimated savings tend to be larger, however, a result based largely on output levels.

In each area our strategy is to identify changes that occur under PACER SHARE and to distinguish them from changes occurring in DS at the other ALCs during the same time period. This involves establishing predemonstration (baseline) levels for all measures at Sacramento and the comparison sites, reassessing the measures annually to determine changes, and comparing the extent of change at Sacramento with that at the other ALCs so as to identify the effects unique to PACER SHARE (which amounts to identifying the difference between the amount of change occurring at Sacramento and at the other ALCs, taken as a whole).

ORGANIZATIONAL FLEXIBILITY

Measures related to organizational flexibility generally exhibited encouraging results, although the pattern was not universal. As intended, the incidence of multiple skill training increased at Sacramento relative to the comparison sites. Also as intended, earnings increased for nonsupervisory employees without an increase in the overall wage bill. At the same time, there was no evidence of pay inversion between supervisory and nonsupervisory positions. Crossovers from white- to blue-collar and blue- to white-collar positions did not increase, and remained infrequent. Moreover, the percentage of career employees increased at Sacramento relative to the comparison sites, as the total work force was decreasing in size. Supervisors' perceptions of classification sat-

isfaction and support from the personnel office improved, as, on balance, did work force perceptions concerning advancement/training opportunities, information exchange, union-management relations, and gainsharing of organizational cost savings.

On the negative side, the percentage of supervisors within DS showed the same change (decline) as at the other Centers. Although this indicates that supervisory positions were not proliferated, it also suggests that the flexibility sought through changes in supervisory grading criteria had not yet been fully realized. Also, support for (permanently) eliminating annual performance appraisals increased more at the comparison sites than at Sacramento, where they were temporarily eliminated as part of the demonstration. Other attitudes bearing on organizational flexibility changed similarly across sites. These included attitudes toward staffing flexibility, pay satisfaction and equity, reward system satisfaction, supervisor grading criteria, the effectiveness of quality programs, and the consequences of job performance.

Overall, there is considerable evidence of greater organizational flexibility under PACER SHARE, as reflected in both the attitude changes and personnel measure effects described above. At the same time, the pattern is not yet fully persuasive. Changes in other attitudes and personnel measures remain to be demonstrated, and there are competing explanations for some of the observed changes, such as the increased seniority of the Sacramento work force.

QUALITY OF WORK LIFE

There is strong evidence of improved quality of work life at Sacramento. Every relevant attitude area shows significant positive change relative to the other Centers. These changes include relative gains in job satisfaction, trust of management and co-workers, organizational commitment, perceived influence over events within Distribution, satisfaction with supervision, emphasis and payoff of team-building activities and group functioning/teamwork, plus a decline in intent to leave DS.

To the extent that PACER SHARE achieves its goal of improving the quality of work life, we also would expect turnover to decrease. At baseline, total turnover was nearly 15 percent at Sacramento—signif-

icantly higher than for the comparison group—representing separations of nearly 11 percent and internal transfers (migration) to other directorates of just under 4 percent, both significantly higher than for the comparison ALCs. During year three of PACER SHARE, as compared with the other ALCs, Sacramento showed declines in turnover. Separations decreased comparably at Sacramento and the other ALCs, whereas the decline in internal transfers and total turnover was significantly greater at Sacramento. As a result, the year-three turnover rates were similar for Sacramento and the comparison ALCs. Since Sacramento had greater turnover at baseline (and previously), the change is consistent with an improvement in quality of work life.

WORK QUALITY AND TIMELINESS

Work quality began at a superior level at Sacramento, and for error rates it showed little change throughout year three of the demonstration. Of six error rate measures, one showed improvement at Sacramento during the third year of PACER SHARE, three showed no change, and two worsened. In contrast, measures concerning receiving timeliness and shipping support deteriorated at Sacramento relative to the comparison group. This may be at least partially attributable to the implementation of the Automated Warehouse System, unprogrammed workloads, and management decisions concerning the release of DOCs and support for the F-15 program.

A number of attitude questions relevant to quality were added to the survey at year one. As noted, the year-three results show significant increases in perceived information exchange in accomplishing work and emphasis on team-building concepts in day-to-day operations. Many of the changes—especially those for team building—were large and highly significant. The changes are consistent both with better work quality and improved quality of work life.

COST SAVINGS

With respect to labor cost savings, PACER SHARE has yielded frequent gainshare payments over the ten quarters beginning January 1989, following several quarters without gainshares. Indeed, our analysis suggests that had the gainsharing formula included an ad-

justment for change in output level between baseline and demonstration period, Sacramento's gainshares would have been still higher. In any case, the gainshare payments imply that labor cost has been below its baseline level. Gainshare payments, however, are not an adequate basis for judging whether PACER SHARE has brought a systematic improvement in Sacramento's productivity. For that, we rely on a multivariate model of labor cost as a function of time and output, which we estimate separately for Sacramento and the other ALCs, for both baseline and demonstration period. The estimated model forms the basis of a series of hypothesis tests. Of most importance, the tests show that Sacramento's labor cost under PACER SHARE was not statistically different than prior to PACER SHARE. Even though gainshares were paid, costs fell within the range expected from Sacramento's pre-PACER SHARE performance. Furthermore, we tested Sacramento's cost relative to other ALCs, whose behavior reflects what might have been expected for Sacramento had there been no PACER SHARE. We found no statistically significant evidence that Sacramento had reduced its cost relative to its peers.

The potential for cost savings remains and could improve as PACER SHARE matures. More workers, for instance, will become trained in multiple skills and therefore qualified for assignment to a wide variety of tasks as they arise. Still, the potential for cost improvement could be affected by factors outside DS control such as Desert Storm, reorganization, and absorption by the Defense Logistics Agency.

FUTURE DIRECTIONS

Although the changes in federal civil service practices required to implement PACER SHARE were in place at its outset, it must be recognized that true implementation must unfold over time. For example, DS employees will have to be provided training to take advantage of increased personnel system flexibility in meeting changing workloads, DOC hires and releases will have to occur over time as the need arises, and so forth. As a result, it is important to observe the longer-term results of PACER SHARE before drawing firm conclusions concerning its effectiveness. Nonetheless, although the year-

three results do not provide evidence of significant cost savings, they offer encouragement that PACER SHARE may be beginning to achieve its desired objectives in other areas.

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Chapter One
INTRODUCTION

This report evaluates the first three years of the PACER SHARE Productivity and Personnel Management Demonstration.¹ PACER SHARE is a five-year demonstration initiated by the former Directorate of Distribution (DS) at the Sacramento Air Logistics Center (ALC) under the authority of Title VI of the Civil Service Reform Act. That title allows the U.S. Office of Personnel Management (OPM) to waive Federal Civil Service regulations on an experimental basis to determine whether alternative procedures improve public personnel management. (Appendix A describes other demonstration projects authorized by OPM.)² After several years of planning, the project was formally initiated in February 1988.

The demonstration is designed to determine whether certain innovations will improve organizational productivity, flexibility, and quality of work life, while sustaining the quality and timeliness of work and the capability of mobilizing during emergencies or wartime. If successful, the interventions constituting the project will be considered for wider application in the federal sector. RAND is the external evaluator for years one through three.

This chapter provides the background on PACER SHARE necessary for understanding the methods and results presented in the rest of the report. The material is largely drawn from OPM's announcement

¹For baseline, first-year, and second-year findings, see R-3753-FMP, 1990; R-3943-FMP, 1991; and R-4127-FMP, 1992.

²Appendices A, B, and C are located at the end of this volume. Other appendix citations in this report refer to MR-310/1-P&R, 1993.

of PACER SHARE in the *Federal Register*³ and provides the justification for the demonstration contained therein. This chapter and Chapter Two, on methods, largely repeat information given in the PACER SHARE baseline report. Readers familiar with that report may wish to proceed directly to the discussion of results, which begins in Chapter Three. Chapter One of this year's report does provide new information concerning the reorganization of DS.

RATIONALE

Broadly speaking, the demonstration grew out of criticism of the federal civil service system (i.e., criticism that its system of classification and compensation, staffing, incentives, and performance appraisal impedes efficiency). The federal job classification system, for example, is complex. It divides work into a large number of small pieces. The General Schedule (GS) for white-collar work defines 440 jobs and is further divided into 18 grades, or levels of difficulty. The Federal Wage System (FWS) for blue-collar work defines 330 jobs in 15 grades. The system's emphasis on classification accuracy encourages the design of narrow jobs. Furthermore, managers have little control over the pay rates of their employees, classified as they are within narrow grades with limited room for within-grade increases. This is an especially important problem for white-collar employees, whose pay does not reflect local market conditions. Pay raises are thus often effected by reclassifying jobs. As a result, managers and personnel specialists devote much time to writing the frequently lengthy position descriptions required to justify narrow grade and series distinctions.

The rigid specialization arising from narrow job classification can contribute to the employment of more personnel than may be required. Narrow and restrictive qualifications interfere with a supervisor's ability to assign work to employees as needed. Managers who try to establish broader, generalist jobs are likely to have trouble getting them classified. At the supervisory level, grading criteria (such as number of subordinates supervised) can encourage "empire building" and the creation of additional layers of supervision.

³*Federal Register*, Vol. 52, No. 224, November 20, 1987, pp. 44782-44810.

Similar concerns apply to staffing. Paperwork is required when an employee is assigned to different duties, whether the action is permanent or temporary. This documentation consumes time and personnel resources, interfering with other needed actions. Reduction-in-force (RIF) procedures for decreasing the size of the work force are also costly and time-consuming.

The incentive awards system provides limited tools for motivating the entire work force. Awards generally go to only a small number of employees and are not perceived as widely available.

Performance appraisal requires the development of performance plans containing elements and standards for every employee. Performance is then evaluated using five rating levels. Setting and measuring performance at five levels for every job, regardless of complexity, increase paperwork and consume time. Moreover, appraisal does not address measurement of aggregate productivity and work quality, which are more important to the Directorate of Distribution than individual performance.

PROJECT GOALS

The PACER SHARE demonstration addresses these criticisms with a set of five interventions put forward by the Directorate, described below. Overall, the objectives of PACER SHARE are to:

- Increase organizational productivity by improving incentives and training to help employees work more effectively and encourage them to originate ideas on improving efficiency.
- Increase organizational flexibility in making job assignments and dealing with fluctuations in workload.
- Enrich the quality of work life by creating a work environment in which individual and organizational goals are compatible, opportunities for individuals to work on a variety of jobs are realized, and training opportunities are expanded.

- Preserve or improve the quality and timeliness of work through quality circles,⁴ team building, and statistical process control.⁵

Achieving these goals requires the adoption of a new management philosophy that encourages greater involvement of all employees in the problems and challenges faced by their organization. Part of this philosophy entails building a sense of “corporate identity” in every directorate member. This philosophy, adopted by the Japanese in the early 1950s, has been articulated by W. E. Deming.

The demonstration aims to promote corporate identity by involving employees directly in improving their organization’s productivity and quality of work life. Productivity (during peacetime or wartime) would be increased by having a more versatile work force, more flexibility in making job assignments, greater ease in dealing with fluctuations in workload, and more latitude for establishing supervisory positions. At the same time, there would be a continuation of effort to improve work quality and timeliness by means of statistical process control and by encouraging worker participation in diagnosing and correcting problems and proposing new solutions.

PACER SHARE is the first OPM-authorized demonstration to be conducted in a unionized environment. In this era of resource scarcity, labor-management cooperation is important if new methods are to be developed for “doing more with less.” The demonstration assumes that most employees want to work effectively, and that if given proper incentives and encouraged to participate, employees will come up with more productive ways of doing their work.

DEMONSTRATION SITE AND POPULATION

As we will discuss in more detail shortly, during the second and third years of the demonstration the Directorate of Distribution was merged into the Directorate of Technology and Industrial Support and partially absorbed into the Defense Logistics Agency. To provide

⁴Quality circles are small groups that converse regularly to discuss work problems and means of improvement.

⁵Statistical process control uses statistical protocols to help identify work processes or areas subject to undesirable variations in quality and to bring such variations under control by correcting problems with the work process.

the required consistency with the earlier evaluations, we organize our evaluation and discussion around the pre-merger conditions. At that time, we described the site as follows.

The Directorate of Distribution at the Sacramento ALC operates under the authority of the Air Force Logistics Command. The directorate consists of warehouses and related facilities for receiving, storing, and shipping materiel in support of U.S. Air Force operations around the world. Such materiel includes spare parts, small arms, uniforms, and food rations. Items are received by the directorate from manufacturers or from Air Force facilities where they are not needed. They are logged in and stored until they are needed by another Air Force facility, when they are packed and shipped. Five other directorates operate at the Sacramento ALC:

- *Maintenance* repairs and modifies weapon systems, performs nondestructive testing of parts, and manufactures parts;
- *Materiel Management* determines stock levels of weapon systems, parts, and equipment; decides whether to repair or buy new equipment; and initiates R&D contracts to improve weapon system reliability and performance;
- *Contracting and Manufacturing* locates sources for needed parts and services and manages procurement actions;
- *Communications and Computer Systems* operates and maintains mainframe computer resources for the ALC, develops and maintains data systems, and provides programming and systems analysis support;
- *Competition Advocacy* finds or develops additional sources of supply in the private sector and researches proposed procurement actions for possible overpricing.

At baseline, the DS was staffed by approximately 1800 civilians, who are participating in the demonstration, and 120 military personnel, who are not.⁶

⁶Military personnel are not participating in the demonstration because they are prohibited by law from participating in gainsharing plans (one of the five interventions) and because the remaining interventions concern changes in the civilian personnel system.

A salient feature of this demonstration distinguishing it from previous ones is the involvement of large numbers of both blue- and white-collar and both line and management personnel. The staff is divided evenly between General Schedule and Federal Wage System (see Table 1). Another important feature is the involvement of labor unions in the project. At baseline, about 20 percent of DS employees were represented by a union.⁷ Of those, 87 percent belonged to the American Federation of Government Employees; the remainder were members of the Technical Skills Association or the Engineer and Scientist Association.

Since the second year of the demonstration, significant changes in organization have affected and continue to affect Sacramento and the other ALCs. The Directorate of Distribution was absorbed into the Directorate of Technology and Industrial Support (TI) at Sacramento and Ogden. In addition, the distribution function has been partially merged into the Defense Logistics Agency at the ALCs. The absorption into TI at Sacramento was part of a change in directorate organization from functional to product line (commodity) organi-

Table 1
Participating Employees by Pay Schedule^a
(Directorate of Distribution, Sacramento Air
Logistics Center)

Pay Schedule and Supervisory Status ^b	Percentage of Work Force	Number of Employees
Nonsupervisory GS	44.2	808
Supervisory GS and PMRS	5.7	105
Nonsupervisory FWS	45.8	838
FWS Supervisory	4.3	78
Total	100.0	1829

^aThe figures reflect work force status as of February 1988.

^bGS is General Schedule (white collar); PMRS is Performance Management and Recognition System; FWS is Federal Wage System (blue collar).

⁷According to a survey of the work force (described below).

zations. Under the reorganization, there exist the following directorates:

- *Financial Management* encompasses financial aspects, such as accounting and the comptroller's office;
- *Technology and Industrial Support* encompasses a wide range of activities, such as maintenance shops working on parts supporting multiple directorates, development and application of technology in composite materials, and distribution functions;
- *Aircraft Management* is responsible for most functions required in support of aircraft at the ALC;
- *Space and C3 Management* is responsible for command, control, and communications support;
- *Commodities* is responsible for repairing items that are not directly related to the aircraft maintained at the ALC.

INTERVENTIONS

Achieving the project goals requires improvements in organizational flexibility and a shift from individually oriented to organizationally based incentives. Accordingly, five interventions were designed:

- Job series consolidation
- Revised base pay determination:
 - Pay banding
 - Eliminating individual annual performance ratings
- Revised supervisory grading criteria
- Revised hiring/retention criteria
- Productivity gainsharing

Job Series Consolidation

Under PACER SHARE, DS's 66 job series were consolidated into six broad "processes." A process was defined as "the progressive and interdependent arrangement of events, machines, methods, and resources that produce a good or service." Jobs that contribute to the same goal were assigned to the same process.

The demonstration consolidated 27 blue-collar series into two processes:

- *Material handling process* encompasses physically receiving, examining, packing, moving, storing, and issuing items.
- *Facilities and equipment maintenance* covers physically maintaining and repairing material processing equipment and facilities. This is divided into seven subprocesses (electronic, electrical, metal working, painting, carpentry, industrial-equipment repair, and mobile-equipment repair).

Second, 39 nonsupervisory white-collar series were consolidated into three processes:

- *Distribution process* covers custody and transportation transactions.
- *Management operations process* covers administrative work in providing clerical and general management support.
- *Engineering process* covers all engineering services. This process is divided into two subprocesses (engineering and engineering technical support).

All supervisory positions were consolidated into one process. As a result, supervision is no longer equated with the top grades in each pay schedule. Workers can enter supervision as a distinct career field if they choose to do so, but they do not have to enter supervision to progress to the highest pay levels within their own process.

One intent of job series consolidation was to reduce the time and complexity involved in operating the classification system. Another, broader intent was to enable workers to be utilized on a wider range of tasks, after they had been appropriately trained. Thus, workers could gain training and experience in a wider variety of work than under the conventional classification system, which offered few opportunities for training or work outside narrowly assigned classifications. Expanding career and multiple-skill training opportunities would enrich the quality of work life. Supervisors would also gain greater capability for prompt reassignment of workers in response to changes in the flow and composition of work. By allowing a worker to be assigned to any job in a process for which he is qualified, the

system was intended to improve Directorate responsiveness to work and mission requirements. Job series consolidation would use substantially fewer classifications to reflect differences in type of work and duties.

Revised Base Pay Determination

As a complement to job series consolidation, base pay determination was revised to incorporate pay banding and exclude performance reviews. This simplified pay progression and eliminated performance appraisal as a factor in determining base pay. These revisions have three major objectives: (1) to support the new classification system by giving managers more flexibility in assigning work, (2) to give employees a wider range of potential salary growth without the need for formal promotion procedures, and (3) to decrease reliance on individual incentives in favor of an improved organizational consciousness.

Pay Banding. Pay banding is the combination of sets of adjacent pay grades into bands, resulting in a simplified compensation system. Broadening pay categories was designed to improve responsiveness to mission requirements by making a larger number of potentially qualified employees eligible for required jobs within a category.

Under this intervention, the traditional GS and FWS systems with their constituent grades were replaced by three pay schedules with just four bands each (see Table 2):

1. Demonstration hourly (DH), covering all wage grade (WG) and wage leader (WL) nonsupervisory positions.
2. Demonstration salaried (DW), covering all GS nonsupervisory positions.
3. Demonstration supervisory (DX), covering all supervisory positions (GS, GM, and WS).

Workers converted to the new schedules at their current earnings level. The new system relies on a guaranteed annual percentage increase in salary within each pay band. The system was designed for progression through each DH band in 12 years; DW-1 through DW-3,

Table 2
Demonstration Pay Schedules
and Bands

New Pay Schedule and Band	Current Grades
Demonstration Hourly	
DH-1	WG-1 to WG-3
DH-2	WG-4 to WG-8
DH-3	WG-9 to WG-11
DH-4	WG-12 to WG-15
Demonstration Salaried	
DW-1	GS-1 to GS-4
DW-2	GS-5 to GS-8
DW-3	GS-9 to GS-12
DW-4	GS-13 to GS-14
Demonstration Supervisory ^a	
DX-1	GS-5 to GS-8
DX-2	GS-9 to GS-12
DX-3	GS-13 to GS-14
DX-4	GS-15

^aThis grouping of pay levels is also used for blue-collar supervisors who were converted based on annualizing their current hourly rate of pay.

DX-1, and DX-2 in 25 years each; DW-4 and DX-3 in 16 years each; and DX-4 in 11 years. These times were chosen to approximate movement under the conventional system, including within-grade, quality step, and merit increases, and promotions. With the exception of the DW-4, DX-3, and DX-4 bands, the percentage of annual increase was intended to be higher during the first half of the applicable period.

The demonstration pay schedules are adjusted when a general increase changes the GS. The demonstration hourly schedule can also be adjusted according to Sacramento-area wage survey results.

As is true for the conventional system, the pay ranges for the bands overlap, so that a new employee may earn less than a senior employee in a lower band. In addition to within-band increases, em-

ployees may earn salary increases by promotion to open positions in a higher band.

Eliminating Individual Annual Performance Ratings. Deming (1987) has hypothesized that individual performance appraisal is counterproductive because it “nourishes short-term performance, annihilates long-term planning, builds fear, diminishes teamwork, and nourishes rivalry and politics.” Under this hypothesis, it is not competition among workers that improves work quality but cooperation, and cooperation is especially important in an organization such as DS where work units are interdependent. Instead of individual appraisal, Deming advocates more careful selection and placement of employees, better training and education, improved leadership and counseling, and statistical process control, which seeks to minimize variations in work quality.

Under PACER SHARE, annual performance appraisals with their performance elements, standards, and achievement ratings are no longer used as a basis for movement within the pay bands. This intervention dispenses with individual ratings, allowing the time and effort entailed in producing them to be allocated elsewhere.

Nonetheless, some individual incentives remain. Employees may still be promoted from band to band (without the time-in-grade requirements of the old system), and they should find their career opportunities enhanced through increased cross-training. Moreover, although individual, as opposed to organizational, incentives are limited under PACER SHARE, it is uncertain whether this represents a meaningful *decrease* in individual incentives from the previous system. In the past, only a very small percentage of the work force received quality step increases, and, even under the Performance Management and Recognition System, employees may have been rewarded as much in rotation as on the basis of outstanding performance.

Revised Supervisory Grading Criteria

In the conventional system, supervisors’ grades traditionally are based in part on the number and grades of the employees super-

vised.⁸ Under this intervention, supervisors' grades are based on factors that reflect the supervisors' job responsibilities and the difficulty of carrying out those responsibilities. The intervention thus eliminates the need for a specific subordinate structure for each supervisory position, allowing supervisors to be assigned to positions where they are most needed. Since salaries are not based on the numbers and grades of subordinates supervised, supervisors are freer to recommend appropriate staffing changes. Specifically, points are assigned to each supervisory job on six factors: workload of organizational unit; position criticality; degree and scope of responsibility delegated; level and purpose of contacts; kind, degree, and character of supervision exercised; and planning horizon. The total number of points accumulated across the factors is used to assign each supervisory position to one of the four bands in the DX schedule.⁹

Revised Hiring/Retention Criteria

The revised hiring/retention criteria are part of a new Demonstration On-Call (DOC) program, replacing the previous on-call hiring authority. New employees are normally hired into the DOC program and are subject to ten days notice for release and three days for recall. DOC employees are eligible for career status after one year, but conversion depends on DS staff needs, and those with the longest tenure are taken first. When workload or budgetary changes require adjusting the size of the work force, managers try to confine the effects to the applicable DOC segment, accounting for veteran preference and seniority. Recall is in the reverse order. In addition, formal reduction-in-force procedures are not required for termination of DOC employees if a RIF is mandated. This should provide considerable time and monetary savings. However, the new on-call program includes a benefits package, in contrast to the previous one.

⁸As authorized by the DoD Appropriations Act, the government is implementing new supervisory grading criteria that do not explicitly rely on number and grades of employees supervised. Whether such factors are indeed removed from consideration is yet to be seen.

⁹For a more complete description of the six factors, see *Federal Register*, Vol. 52, 1987, p. 44792.

Productivity Gainsharing

Productivity gainsharing is a system based on total organizational performance in which cost savings generated during the demonstration are shared equally between the Air Force and DS employees. Cost savings equal the difference between what a workload would have cost under the existing system and what it actually cost under the demonstration. Work quality and timeliness must be maintained at acceptable levels, and the "would have" cost is subject to periodic adjustment for such factors as the introduction of cost-saving technology or work methods. (Prior to adjustment, the "would have" cost remains the same for a year if means of "working smarter" are introduced at employee suggestion and for six months if they are not.) Cost savings computations are confined to operations and support costs and exclude capital costs (plant and most equipment). Over 90 percent of operations and support costs are for labor; therefore, most cost savings come from reduced labor costs. That is, cost savings under the gainsharing system are realized only if the same work is performed for fewer labor dollars or more work is performed for the same labor cost. Unless the workload and funding for DS are increased, the major source of cost savings is the ability of the work force to absorb the workload of employees who leave through natural attrition processes.

This system offers an extrinsic incentive to DS employees intended to help them and the Air Force take advantage of the opportunities for greater productivity that should accompany the changes in the personnel system. It similarly should provide greater incentive to participate in DS's quality circles, process action teams, and task forces. These programs contribute to a work-team-based environment, promoting employee participation in identifying and solving organizational problems related to work quality and productivity.¹⁰

The intention is to link organizational performance directly to individual compensation. Gainsharing payments are linked to the performance of the organization as a whole rather than to the performance of divisions or branches. The purpose of organizational-level payments is to compensate for inequity of opportunity to earn gain-

¹⁰Quality circles, begun in 1980, predate PACER SHARE.

shares in some divisions or branches (and branches might not set productivity criteria consistent with DS-wide criteria). Directorate-level gainshares also are more in keeping with PACER SHARE's corporate focus. Payments to DS employees are made in equal dollar shares rather than being based on a percentage of salary.

RISKS OF THE DEMONSTRATION

Despite the goals of PACER SHARE and the expected benefits of the interventions, there may be risks in the demonstration. Organizational change involves risk whenever there is uncertainty about how to implement specific changes and the range of their possible outcomes. If there were no uncertainty and the expected outcomes were all positive, the changes would be made immediately, barring some overriding constraint or regulation beyond the organization's control. Analysts as well as proponents of the demonstration must be aware of downside risks, not only to be sure that the evaluation framework accounts for them along with the expected benefits, but also to help formulate hypotheses about why the interventions were, or were not, effective. Downside risk means that the organization may become worse off under the demonstration as a whole (or under particular changes) than it would have been without it.

Negative outcomes could arise for a variety of reasons, including the following:

- Negative feedback created by eliminating performance appraisals. As pay increases will not be tied to individual performance through appraisals, workers' incentives to shirk could increase, leading to lower organizational productivity.
- Inefficient expansion of supervisory positions. As fewer subordinate positions will be needed to justify a supervisory position, the latter could be inefficiently proliferated.
- Higher outflow of workers due to expanded training. Under PACER SHARE, employees will be more broadly trained and thus should have more opportunities to work outside DS. If compensation does not keep pace with offers from alternative employers, workers could leave DS, causing the Directorate to bear the costs of training but not reap its benefits.

- More transfers out of DS because of the desire to earn promotions eliminated by pay banding or higher separation among those whose near-term step increases under the previous system would have exceeded their annual pay adjustments under PACER SHARE.
- Unexpectedly fast wage growth. If the algorithm used to compute annual pay growth results in greater growth than would have occurred without PACER SHARE, costs could increase rather than decrease.

The evaluation of the demonstration is structured to account for these and other negative outcomes that might result and to examine interrelationships among the interventions that might account for difficulties in achieving the project's goals (for example, failure to provide the training needed to take advantage of the opportunities for organizational flexibility provided by series consolidation and pay banding). Although it is necessary to plan the evaluation to account for the possibility of negative outcomes, the demonstration was undertaken with the expectation that its benefits would outweigh any costs.

Risk is inherent not only in the demonstration's outcomes but in the way it is implemented. For example, a key to effective startup lies in reducing the forces initially impeding cooperation (e.g., reducing threats) while increasing favorable forces (e.g., incentives). This is discussed more fully in OPM's implementation report.¹¹

EVALUATING THE DEMONSTRATION

RAND's evaluation is intended to measure the extent to which the goals and risks of the PACER SHARE demonstration are realized. Chapter Two describes in detail the criteria and means employed in assessing the project's outcomes, along with the measures used. Basically, we hypothesize a set of outcomes in the form of an evaluation model. We then compare the outcomes at the Sacramento Air Logistics Center to the values of identical variables before the demonstration and at other Air Logistics Centers not subject to the

¹¹Office of Personnel Management, 1989.

demonstration. Measures of organizational flexibility and quality of work life were developed by RAND (drawing, in many cases, from OPM-defined variables). They are evaluated from survey data collected by RAND (Chapter 3 gives results to date) and personnel data routinely collected by the Air Force (see Chapter Four). Measures of work quality and timeliness (Chapter Five) and cost savings (Chapter Six) also were developed by RAND and evaluated with data gathered from Air Force records. Our conclusions as of the end of demonstration year three are given in Chapter Seven.¹²

For a demonstration of this magnitude, a substantial evaluation period is required before firm conclusions can be drawn to guide future policy. Thus, the conclusions drawn in Chapter Seven must be considered tentative. Given the organizational changes that have affected the Sacramento ALC and the partial merger of Distribution into the Defense Logistics Agency at all ALCs over years four and five, obtaining the consistent, meaningful data required to form firm conclusions is likely to prove very challenging.

¹²Predemonstration (baseline) data are summarized for comparison in Chapters Three through Six. More detailed baseline findings are documented in R-3753-FMP.

Chapter Two

THE PACER SHARE EVALUATION: METHODS, MEASURES, AND DATA SOURCES

To measure the effects of the five PACER SHARE interventions, RAND has designed an evaluation that assesses the extent to which PACER SHARE realizes its goals. This design has been worked out in collaboration with the Directorates of Distribution, Personnel, and Accounting and Finance at McClellan Air Force Base and with the Office of Personnel Management. Because the demonstration is being conducted in a natural environment rather than under controlled laboratory conditions, it is quasi-experimental in nature. The evaluation employs a comparison group to help determine the effects of the demonstration. Four other Air Logistics Centers throughout the country perform functions similar to those of the Sacramento ALC and collectively serve as the comparison group; they are not participating in the demonstration but provide the same types of data that are collected at Sacramento. The four ALCs are located at Hill Air Force Base, Ogden, Utah; Kelly Air Force Base, San Antonio, Texas; Robins Air Force Base, Warner-Robins, Georgia; and Tinker Air Force Base, Oklahoma City, Oklahoma.

The evaluation is designed to identify the effects of the interventions by comparing the test site with the comparison sites before and during the demonstration period. In any such demonstration, many factors can change over time, from the scope of the organization's mission to its workload, production technology, factor costs, incentives, and rewards. Therefore, the demonstration should not be viewed as a tightly controlled experiment in which an isolated factor is permitted to vary while others are not. By using baseline (predemonstration) data as well as comparison sites, the evaluation is structured to

ask (1) whether quality of work life, organizational flexibility, quality and timeliness of work, and productivity improved at the Sacramento ALC during the demonstration, and (2) whether they did so to a greater extent than expected without the interventions. A comparison of Sacramento's performance during the demonstration with its performance at baseline should tell whether improvement occurred. To judge whether Sacramento's performance improved relative to what was expected, its performance is compared with that of the other ALCs taken as a group. Their combined performance reflects general, systemwide tendencies and provides a measure of how well Sacramento might have done on average.¹

How comparable are the ALCs? They share, for example, many characteristics, including similar workloads, job standards, and personnel practices. Nevertheless, among the ALCs there are specific differences in factors that affect job performance, the most obvious example being the physical layout of the DSs. Such differences imply that the times allotted for the performance of specific tasks vary across the ALCs, even though the same methods are used in computing the times. There also may be differences in the composition and compensation of the work force among the ALCs that could affect the outcome measures being evaluated.

By and large, the similarities and differences among the ALCs tend to persist through time,² making cross-ALC comparisons meaningful over the course of the demonstration. Furthermore, what change does occur generally is directed by Headquarters, Air Force Logistics Command, so there is a tendency for all ALCs to change in the same way. Moreover, by agreement with the Air Force, no unique policy changes will be applied to Sacramento, nor will Sacramento be exempted from policy changes affecting other ALCs.

The general persistence of characteristics and the tendency for any change to occur systemwide fit comfortably into the analytic paradigm set forth above. Differences among the ALCs at the outset

¹In addition, the companion volume (MR-310/1-P&R) gives data for each ALC. These data allow trends to be detected and pairwise comparisons to be made. Such comparisons could lead to a more informed judgment about the combined ALC comparisons.

²Based on information received from Sacramento and Headquarters, Air Force Logistics Command, as well as on our own data analyses.

of the demonstration are netted out by comparing outcomes at Sacramento and the comparison group to their own baselines. Effects of systemwide changes should be picked up in trends at the comparison group. Subtracting the latter from the trend at the demonstration site should then yield evidence of the demonstration's effects.

To evaluate the demonstration, it is necessary to identify expected outcomes by intervention, define operational measures of the outcomes, and specify the data sources. As Table 3 indicates, each intervention has expected, measurable effects, as does the combination of interventions. Nonetheless, because the demonstration implements all interventions at the same time and at a single site, the effects of any single intervention cannot be isolated from the others. The effects of the demonstration must be viewed as arising from the set of interventions. These effects can be grouped into four categories corresponding to the broad goals of the demonstration, which are to improve the following:

- Productivity (cost savings)
- Organizational flexibility
- Quality of work life
- Quality and timeliness of work.³

We break the rest of this chapter into subsections corresponding to each of the demonstration's goals. (For the discussion that follows, we group organizational flexibility and quality of work life together because the same instruments and sources are used to derive measures of achieving those two goals.) Within each subsection, we discuss the data sources (summarized in Table 4) and methodologies employed to determine whether the demonstration is meeting the

³We do not explicitly evaluate one of the demonstration's goals—sustaining or improving mobilization capability during emergencies or wartime. We believe this goal will be achieved if organizational flexibility and productivity improve. Testing the attainment of greater contributions to mobilization would require an exercise, which could be conducted at a later date if the Air Force so desires.

Table 3
Evaluation Model

Intervention	Expected Effects	Measures	Data Sources
I. Job series consolidation	A. Simplified job classification process	1. Number of classification actions 2. Classification error rate 3. Number of classification appeals 4. Number and grades of personnel staff serving Distribution 5. Employee perceptions of classification process	Personnel records, Personnel Office Productivity Analysis (POPA) Personnel records audits POPA POPA Attitude survey
	B. Improved responsiveness to work/mission requirements through increased flexibility in making assignments to meet workload	1. Perceived flexibility by supervisors 2. Skill base of work force	Attitude survey Work Force Database (WFDB) from personnel computer system
	C. Expanded career and training opportunities/ job enrichment	1. Incidence of multiple skills training 2. Intrinsic work satisfaction 3. Satisfaction with career opportunities	WFDB Attitude survey Attitude survey
	D. Reduced need for promotions	1. Number of promotions 2. Satisfaction with promotions	WFDB Attitude survey

Table 3—continued

Intervention	Expected Effects	Measures	Data Sources
II. Revised base pay determination (Pay banding and eliminating annual performance ratings)	A. Increased comparability of pay for GS and WG workers	1. GS and WG salaries by experience level 2. Crossovers from GS to WG and vice versa 3. Blue/white collar equity	WFDB WFDB Attitude survey
	B. Increased pay satisfaction	1. Salary increases by experience/classification 2. Extrinsic reward satisfaction 3. Pay satisfaction 4. Perceived equity (internal, external)	WFDB Attitude survey Attitude survey Attitude survey
	C. Possible pay inversion	1. Supervisor vs. nonsupervisor salaries 2. Salaries for current employees vs. new hires	WFDB WFDB
III. Revised supervisory grading criteria	A. Less disincentive for supervisors to reduce staff	1. Supervisors' perceptions of grading criteria 2. Supervisors' willingness to recommend staff reductions	Attitude survey Attitude survey
	B. Increased dependence of pay level on job responsibilities	1. Pay level by responsibility level on new criteria 2. Supervisors' perceptions of pay level determination	WFDB, classification audits Attitude survey
	C. Streamlined organizational structure	1. Percentage of supervisors by level of supervision 2. Percentage of supervisors by division	WFDB WFDB

Table 3—continued

Intervention	Expected Effects	Measures	Data Sources
IV. Revised hiring/ retention criteria	A. Capability to vary size of work force and retain key personnel	1. Correlation of actual (paid) hours with workload 2. Cost of work force reduction (if RIF)	Accounting Directorate (AC) cost savings analysis WFDB, POPA, personnel record audits
V. Productivity gainsharing	A. Link bonus pay with organizational perfor- mance	1. Cost savings and gainshares paid (dollar value) 2. Productivity index: actual hours/workload 3. Perceived link between organizational performance and bonus pay	RAND cost savings analysis, AC cost savings analysis AC data Attitude survey
VI. Combination of interventions	A. Improved productivity B. Improved/maintained quality and timeliness	1. Production levels and cost savings 2. Effectiveness of quality measures 3. Supervisors' perceptions of ability to meet workload changes 4. Performance during surge periods and exercises 5. Multiple skill training 1. Quality and timeliness rates	RAND and AC analyses of costs and production Attitude survey Attitude survey DS records WFDB RAND analysis of quality/ timeliness data from Quality and Management Divisions

Table 3—continued

Intervention	Expected Effects	Measures	Data Sources
	C. Improved ability to fill vacancies	1. Number of authorizations vs. assignments 2. Number of applications 3. Acceptance rate	Personnel records POPA POPA
	D. Reduced turnover and retention of key personnel	1. Turnover by organization, pay level, career category 2. Applications for transfer to outside organization 3. Turnover intention 4. Ratio of career to noncareer employees	WFDB POPA Attitude survey WFDB
	E. Improved organizational climate	1. Organizational climate/involvement 2. Grievances/unfair labor practices 3. Organizational influence 4. Union-management relations 5. Group functioning/teamwork 6. Absenteeism/leave rates by type 7. Adverse actions	Attitude survey POPA Attitude survey Attitude survey Attitude survey Accounting records POPA
	F. Increased job satisfaction	1. Job satisfaction 2. Extrinsic reward satisfaction 3. Intrinsic reward satisfaction	Attitude survey Attitude survey Attitude survey
	G. Increased personnel office support	1. Employee perceptions	Attitude survey
	H. Improved supervision	1. Satisfaction with supervision	Attitude survey

Table 4
Data Collection and Analysis Plan

Area of Analysis	Instrument/Method/ Database	Data Collector	Collection Schedule	Sample
Changes in productivity	Cost savings analysis (existing Accounting and Finance and Distribution automated databases)	Directorate of Accounting and Finance Directorate of Distribution	Baseline, monthly during demonstration	Available for Distribution at Sacramento Air Logistics Center and comparison sites
Organizational flexibility and quality of work life	Attitude survey	RAND	Baseline, annually during demonstration	Distribution employees At Sacramento: all employees At comparison sites: all supervisors, 550 nonsupervisors
	Personnel Office Productivity Analysis	Directorate of Personnel, OPM	Baseline, quarterly during demonstration	All Directorate of Personnel employees servicing Distribution Sacramento and comparison sites
	Personnel records (manual record systems pertaining to Distribution)	Directorate of Personnel, OPM	Baseline, annually during demonstration	Sacramento and comparison sites
	Work Force Database (existing automated personnel records)	Directorate of Personnel	Baseline, annually during demonstration	Civilian employees of Directorate of Distribution Sacramento and comparison sites
Quality and timeliness of work in Directorate of Distribution	Quality/timeliness analysis (existing automated Distribution data and authorized audits by Distribution)	Quality and Management Divisions in Directorate of Distribution	Baseline, monthly to quarterly during demonstration	Sacramento and comparison sites

goal under consideration. We also present results from analyses that aided in the design or validation of the methodological tools. Results of the evaluation produced by the tools themselves are given in Chapters Three through Six.

MEASURING PRODUCTIVITY: ANALYSIS OF COST SAVINGS

The cost analysis attempts to determine whether productivity is observed to increase under PACER SHARE more rapidly than otherwise expected, where productivity increase is reflected through lower output cost.⁴ A fundamental question is how expected cost should be characterized. The analysis examines expected cost from two perspectives. The first is whether the rate of cost growth at Sacramento is slower under PACER SHARE than would have been projected from Sacramento's base period experience. The second concerns Sacramento's cost growth relative to that experienced by the other ALCs. Slower cost growth is consistent with a positive effect of PACER SHARE on productivity, but it is not strong evidence because other changes can occur contemporaneously with PACER SHARE that also affect cost growth. Such changes fall into two categories, system-level changes such as those promulgated by the Air Force Logistics Command, which has oversight for the five ALCs, and changes specific to Sacramento and each other ALC. We *control* for system changes by analyzing the combined behavior of the other ALCs. In particular, using regression analysis, we compare cost growth at the other ALCs before and during PACER SHARE with that occurring at Sacramento, to evaluate Sacramento's performance relative to that expected without the demonstration. Regressions cannot be used, however, to *isolate* ALC-specific changes unrelated to the demonstration. If such changes occur at Sacramento, affect cost, and are contemporaneous with PACER SHARE, they will be inter-

⁴Formally, we are not studying productivity; a true analysis of productivity examines the increased output for a given bundle of inputs while holding the price of those inputs constant. In our case, cost savings might arise either from increased productivity of inputs or from decreased costs (wages). As we will see, however, Sacramento wages appear to be rising relative to wages at the other ALCs. In the analysis below, when we compare Sacramento's cost savings with cost savings at the other ALCs, the fact that Sacramento's wages rose more rapidly means that any cost savings observed will *understate* productivity gains there.

twined with the effects of PACER SHARE in the cost estimates for Sacramento. Similarly, such changes at other ALCs may affect their cost estimates.

Variables Measured

The cost analysis focuses on *labor cost*, which constitutes over 90 percent of *short-run variable cost* (the remaining costs stem primarily from shop supplies such as wood, staples, packing material, etc.). There are no available data on energy and capital costs, but those costs probably varied little over the analysis period. Energy use (heating, lighting) appeared to remain approximately constant at preperiod levels during the course of the demonstration period under evaluation. Capital costs related to plant and facilities also changed little because the same buildings and layout were maintained at the ALCs. A major change in equipment—the Automated Warehouse System (AWS)—was introduced at the ALCs in the years just before PACER SHARE began. The phase-in period differed somewhat across the ALCs (Sacramento was second), but we expect AWS to have little effect on our cost savings analysis given the timing and duration of its implementation. *Output* is measured by monthly transactions—issues and receipts of materiel—between the DS and other directorates on and off base. We obtain data on issues and receipts off base, issues and receipts on base to maintenance, issues and receipts on base but not to maintenance, and issues on base to disposal. Issues and receipts are associated with various sets of tasks that in aggregate amount to the workload. For instance, a received package is typically unloaded, unpacked, and inspected; its contents might then be placed in storage on site, issued to maintenance for repair, or perhaps combined with other materiel to be shipped to another destination. Issues may require retrieval from storage, packaging, packing, inspection, and transportation to the point of shipment. Of course, there also are a host of related support activities such as quality and timeliness assessments; inventory control; re-warehousing; maintaining a paper trail for each item received, stored, or issued; audits; and staff training. In addition, employees participate in activities associated with more general initiatives such as team building and quality circles.

We concentrate on issues and receipts because they reflect the mission of the organization. Since DS's business is transshipment, issues and receipts are a valid measure of output. An alternative measure of output would incorporate internal support tasks. Those are used in determining manning authorizations but are rarely used in measuring productivity, because they are not necessarily tied to external demands for services (i.e., they can be thought of as intermediate support activities) and may be varied at internal discretion. For example, an ALC could possibly exaggerate its apparent workload by increasing the volume of internal tasks above the minimum necessary to handle its issues and receipts. If Sacramento did so during PACER SHARE, for example, it could give the appearance of producing more output with the same paid hours of work, thereby making PACER SHARE seem effective. Similarly, other ALCs could conceivably do the same thing, which might make them appear more productive relative to Sacramento. In actuality, the multiplication of needless support tasks is indicative of lower productivity.

To ensure that cost savings indicate true productivity gains, we must check to see that quality and timeliness do not decline under PACER SHARE. To accomplish that, we initially considered including quality and timeliness variables in the regressions. But that is not a viable approach because of the way quality and timeliness outcomes are generated. When a quality measure declines, for instance, steps are soon taken to identify the cause and correct it. As a result, the observed mean and variance of quality and timeliness measures tend to follow the standard sought and its level of tolerance. Consequently, instead of the regression approach, we separately monitor the quality and timeliness indicators. Quality and timeliness indicators are described later.

Data: Sources and Adjustments

We use monthly labor cost and output data from routinely maintained data systems that are comparable across all ALCs. The labor cost data—total payroll by month—come from their workload system (designated D012). (The base period includes monthly observations from October 1984 through December 1987, and the “year-three” data actually cover 42 months of the demonstration period, January 1988 through June 1991.) These data have been adjusted for

wage inflation and are stated in constant 1989 dollars, thus avoiding confounding the effects of inflation with other effects. The cost inflator is based on the figures shown in Table 5, taken from Chap. 5 of Air Force Regulation 173-13. The annual inflation rate was assumed to be valid at the midpoint of the fiscal year, and the inflation rates for intervening months were found by interpolation and for end months by extrapolation. For example, the inflation rate for February 1989 is equal to the inflation rate for March 1989 (1.000) plus one-twelfth the difference of the 1989 rate from that of 1988. The wage inflators shown in Table 5 were further adjusted for wage growth resulting from the introduction of the Federal Employee Retirement System, which led to rapid growth in the wage bill during 1986 and 1987 as the system was phased in.

Two sources of output data are available. One source is the workload system and the other is the financial system (the latter consists of the system designated D033 and the Standard Base Supply System). The workload system ties each issue or receipt to a specified series of transactions related to its processing, which in turn are linked to its labor standards; this system is used in scheduling and manpower planning. The workload system draws its input from relevant financial-system records and from manual entry. The workload output data have two disadvantages: they count transactions rather than counting issues and receipts directly, and they are not auditable. The financial system data avoid these disadvantages; issues and receipts are counted directly and are audited. Moreover, a complete file of output data is available for this system but not the workload system. For these reasons, we use the financial system data on output.

Table 5
Wage Cost Inflator

Fiscal Year	Inflator
1985	1.202
1986	1.190
1987	1.129
1988	1.035
1989	1.000
1990	.966
1991	.930

Econometric Model

We begin by discussing a simple regression specification, where the natural logarithm (\ln) of labor cost depends on time and (\ln) output level:

$$\ln c_t = a_0 + a_1 t + a_2 \ln x_t + e_t \quad (1)$$

The specification assumes: (1) the labor cost change from one month to the next occurs at a constant rate of a_1 , that is, a_1 is the time trend in labor cost, and (2) labor cost is proportionately related to output, that is, labor cost changes by a_2 percent for a one percent increase in output. The time trend a_1 can be positive or negative depending on whether wages are rising faster than productivity. If productivity were improving and wages were declining, a_1 would be negative. We expect a_2 to be positive but less than one. This is because the demand for labor should increase as workload increases, and so the amount spent on labor should also increase. However, it is typically less costly to vary the work force utilization rate (proportion of time actively engaged in work) and effort rate (output per unit time when actively working) than to add or release workers. As a result, part of the added work needed to handle a bigger workload comes from greater exertion by workers already on the payroll. Thus, labor cost should rise by a smaller percent than output.⁵

For our empirical work, we basically expand the above specification to allow separate coefficients for other ALCs during the base period, other ALCs during the demonstration period, Sacramento during the base period, and Sacramento during the demonstration period. This kind of flexibility is essential to testing our cost hypotheses. For instance, PACER SHARE could increase the rate of productivity improvement, implying a lower time trend coefficient (a_1) for Sacramento during the demonstration than the base period. Furthermore, the change in supervisory grading criteria as well as the use of Demonstration On-Call employees could allow Sacramento to

⁵Two other variables normally would appear in this model: the price (or amount) of capital and the real wage rate of labor (i.e., adjusted for inflation). We do not have data on these variables apart from an overall wage inflator, which we used to adjust labor cost but which is not ALC-specific. However, their absence will have little effect on empirical results because in the short term they change little.

maintain a smaller work force, which would be reflected in a lower intercept (a_0) in the demonstration period. Job series consolidation, revised base pay determination, and increasingly pervasive training in multiple skills could increase the work force capability to respond to workload fluctuations. This would tend to make the workload coefficient (a_2) smaller. That is, if a given work force can handle a wider variety of tasks, and managers have the authority to assign workers promptly to those tasks, then there should be less variation in work force size, hence labor cost, as output varies. Counteracting this effect, Sacramento could make greater use of its DOCs, adding and subtracting them as needed, which would make labor cost more responsive to workload. Thus, the workload effect could become larger or smaller than at baseline.

MEASURING ORGANIZATIONAL FLEXIBILITY AND THE QUALITY OF WORK LIFE

Organizational flexibility and quality of work life are both measured using survey data and data from computerized files of the Directorate of Personnel. In concert with the Office of Personnel Management, RAND developed an extensive survey of attitudes in the workplace. The survey covers a broad range of quality of work life issues, such as job satisfaction, pay satisfaction, organizational involvement, motivation, and supervision. There also are questions concerning organizational flexibility. For example, supervisors are asked about their perceptions of the job classification process, freedom to make assignments to meet the workload, ability to meet changes in workload, and criteria used for establishing supervisory grades. The survey items include numerous OPM core items previously tested for their reliability and validity that are meant to provide comparisons with other demonstrations as well as a variety of questions specifically tailored for PACER SHARE. Most of the items consist of brief statements followed by a five-point Likert scale indicating level of agreement with the items.⁶ The survey was administered before project implementation and is being administered annually to DS employees at the Sacramento ALC and the comparison sites.

⁶See App. A in MR-310/1-P&R for the full questionnaire.

Changes in the quality of work life also are measured with nonsurvey data derived from information contained in the records and computerized databases of the Directorate of Personnel. The measures include separations and migrations (internal transfers), among others. These data were collected for 1987 to establish a baseline and are being collected annually to assess the effects of PACER SHARE.

Organizational flexibility also is assessed using personnel measures. These measures in the automated personnel database system include factors such as the skill base of the work force, supervisory levels, and pay-related measures. In future years, some measures of flexibility are to be measured through a special survey analysis developed by OPM, namely, the Personnel Office Productivity Analysis. This is a survey of classification actions, number of applications, and other personnel office worker output (measured by quarter) and the time required to generate such outputs (measured over a two-week period each quarter). Special audits of personnel records are to be used for other flexibility measures (classification error rate and the cost of any reduction in force that might be implemented).

The analytical framework for assessing changes in organizational flexibility and quality of work life provides the means to determine the statistical significance of three types of effects:

- Differences in organizational flexibility and quality of work life between the Sacramento ALC and the comparison site group prior to the demonstration, that is, the baseline scale value at Sacramento minus the scale value for the comparison site group.
- Changes in organizational flexibility and quality of work life within the Sacramento ALC and the comparison group during the demonstration period.
- Differences between the extent of change at Sacramento and at the comparison site group relative to the baseline values for each, that is, change in the scale value at Sacramento minus change in the scale value for the comparison group.

For nonsurvey measures, both multivariate regression analyses and tests of the difference in proportions (or means) between the Sacramento ALC and the comparison ALCs are conducted. Survey measures are analyzed using multivariate regression. Many of the

individual items in the survey are combined into more broadly defined scales, based both on previous analyses of similar items and the results of factor analyses. The broad scales cover such areas as intrinsic work satisfaction, organizational climate, and adequacy of supervision.

Survey Methods and Measures

Survey Administration. The baseline survey was administered to personnel of the Directorate of Distribution at each of the Air Logistics Centers during the period from late fall 1987 through winter 1988, just before the demonstration started. (See R-3753-FMP for administration and response rate detail.) The third-year survey was administered in spring 1991 (see Table 6). The survey sample consisted of all DS employees at the Sacramento ALC and 550 randomly chosen nonsupervisors plus all DS supervisory personnel at each of the four other ALCs (about one-third of the work force). Supervisors were oversampled to strengthen separate analyses of their results, given that they compose only 10 percent of the work force. Overall, we chose sample sizes based on a desire to detect attitude changes of one point on a five-point scale among 10 percent of the work force with a reasonable degree of statistical precision ($p < .10$).

The baseline questionnaire consisted of 150 multiple-choice questions concerning respondents' attitudes toward their work environ-

Table 6
Third-Year Survey Administration Dates and Response Rates

ALC	Dates Administered	Number of Respondents	Sample Size	Gross Response Rate, %
Sacramento	19-21 March 91	939	1366	68.7
Ogden	12 June 91	466	722	64.5
Oklahoma City	26 June 91	538	737	73.0
San Antonio	24-25 June 91	513	781	65.7
Warner-Robins	10-11 June 91	397	725	54.8
Total/average		2853	4331	65.9

ment, 22 background and demographic questions, and four items for Sacramento employees concerning PACER SHARE. The questions were drawn from a standard list prepared by the OPM for use and comparison in demonstration projects supplemented by specific items developed by RAND (in consultation with DS) for PACER SHARE. Seventeen questions were added to the survey for the first-year and subsequent follow-ups. Most of those dealt with team building and other aspects of workers' sense of participation in DS's mission. For the third-year survey, a series of questions dealing with the absorption of DS into TI and its partial merger into DLA were added (see Chapter One). Additional questions were added concerning the RIF that occurred during spring 1991.

RAND staff administered the survey on-site in group sessions, which typically consisted of 60 to 150 personnel. To facilitate candor, respondents were not identified on the questionnaires. (Thus, it will not be possible to track individual respondents through the course of the demonstration.) The RAND staff member began with a short explanation of the purpose of the survey and answered any questions. Respondents then completed the self-administered form, working independently. The average time required to fill out the third-year questionnaire was 30 minutes.

Overall, the gross response rate across the five ALCs was 66 percent (see Table 6), which represented a response rate of 69 percent at Sacramento and 65 percent for the comparison group (i.e., the other ALCs, collectively).⁷ Supervisory and nonsupervisory response rates were 61 and 70 percent, respectively, at Sacramento and 62 percent and 66 percent for the comparison group. An examination of personnel records for the survey dates suggests that up to half of the individuals who did not report for the survey were on annual or sick leave or were otherwise not physically available to report for the survey. The refusal rate among those who did report was very low, amounting to less than one percent at each site.

Scale Construction. Planned and exploratory analyses were performed on the baseline survey data. To begin with, the items constituting each scale identified by OPM before the baseline survey were

⁷Overall response rate at baseline was 72 percent; the Sacramento rate was 80 percent, and the comparison group rate was 68 percent.

grouped together (the order of item presentation in the questionnaire had been randomized to minimize the development of response sets) and Cronbach's Alpha Coefficient was computed. The coefficient indicates the extent to which the answers to the items were correlated with each other (i.e., the extent to which the items behaved as a scale in the survey). Next, based on an extensive analysis of the intercorrelations among the survey items and the groupings of items resulting from factor analyses, we modified several of the OPM scales by adding one or two items whose responses were found to be highly related to those of the items originally included in the scale. (Results of the factor analyses are given in App. C of N-3146-FMP.) Item discriminant validity analyses also were made to see whether items correlated more highly with their own scales than with other scales. The resulting measures formed the final set of "OPM scales" used in the analysis.

Table 7 shows the final "OPM scales" used in the evaluation and the variables (i.e., survey questions, by number) making up each scale. Modified scales are indicated by an alphabetic suffix appended to the scale number (e.g., OPM03B); the added item(s) are italicized. The table also shows the Alpha Coefficient obtained for the scale, based on the answers provided by all of the respondents across the five ALCs at baseline. The bracketed Alpha Coefficient for the modified scales reflects the Alpha obtained before the inclusion of the added item(s).

In some instances, the questions' polarities were reversed when they were combined with the other questions defining a scale to generate the mean scale score. For example, under External Equity (OPM04), strong agreement with V070 indicates equity, whereas strong agreement with V022 indicates inequity. Therefore, in averaging each individual's responses to the two questions to come up with a scale average, the Likert categories for V022 were reversed in value. As a result, "strongly disagree" with V022 (inequity) was given the same value as "strongly agree" with V070 (equity). In Table 7, instances of reversed responses are noted with asterisks (e.g., ** V007, V101 reversed").

Table 7
OPM Scales: Questions and Alpha Coefficients

Alpha [Old]	Scale Code	Scale Name and Question
.631	OPM02	CONTROL OVER WORK V017 I have control over how I spend my time working. V055 I have a great deal of say over what has to be done on my job. V071 In DS, authority is clearly delegated. V077 I have the authority I need to accomplish my work objectives.
.646 [.519]	OPM03B	EXPECTANCY V043 Working hard on my job leads to good job performance. V061 Working hard on my job leads to gaining respect from my co-workers. V025 <i>Coming up with new ways to do my job leads to good job performance.</i>
.700	OPM04	EXTERNAL EQUITY ** V022 reversed V022 Other employers in this area pay more than the government does for the kind of work I am doing. V070 My pay is fair considering what other places in this area pay for the same kind of work.
.757 [.669]	OPM05B	EXTRINSIC REWARD IMPORTANCE (V124-V126: How important is each of the following to you?) V125 Your chances for getting a promotion? V126 The amount of job security you have? V124 <i>Retirement benefits?</i>
.850	OPM06	GENERAL SUPERVISION/DIRECTION V014 My job duties are clearly defined by my supervisor. V019 My supervisor handles the administrative parts of his/her job well. V050 My supervisor sets clear goals for me in my present job. V074 My supervisor encourages me to help in developing work methods and job procedures. V075 My supervisor helps me solve work-related problems. V089 On my job I know exactly what is expected of me.
.803	OPM07	GROUP FUNCTIONING V004 My unit works well together. V011 I have confidence and trust in my co-workers. V018 My co-workers encourage each other to give their best effort. V100 All in all, I am satisfied with my work unit.
.664	OPM08	INTENT TO TURN OVER V085 I often think about quitting. V105 During the next year I will probably look for a new job outside DS.

Table 7—continued

Alpha [Old]	Scale Code	Scale Name and Question
.477	OPM09	INTERNAL EQUITY V048 Pay differences in DS fairly represent real differences in levels of responsibility and job difficulty. V087 My pay is fair considering what people in other directorates are paid.
.877	OPM10	INTRINSIC REWARD IMPORTANCE (V120–V123: How important is each of the following to you? V120 Challenging work responsibilities? V121 The chance to accomplish something worthwhile? V122 The chance to learn new things on your job? V123 Getting a feeling of accomplishment from your job?)
.789	OPM11	INTRINSIC WORK SATISFACTION V033 My job allows me to achieve personal satisfaction. V086 My job is challenging. V090 The work I do on my job is meaningful to me.
.837	OPM12	JOB SATISFACTION V054 In general, I like working here. V058 In general, I am satisfied with my job.
.425	OPM13	LOCKING IN ** V030 reversed V030 I could find a job with another employer with about the same pay and benefits as I now have. V047 It would be very hard for me to leave my job even if I wanted to. V083 I have too much at stake in my job to change jobs now.
.674	OPM14	OPEN GROUP PROCESS ** V057 reversed V005 If we have a decision to make, everyone is involved in making it. V057 My co-workers are afraid to express their real views. V068 In my work unit we tell each other the way we are feeling. V094 In my work unit everyone's opinion gets listened to.
.739	OPM15	ORGANIZATIONAL CLIMATE ** V013, V038, V052 reversed V013 Employees here feel you can't trust management in this directorate. V038 In DS, conflict that exists between work units gets in the way of getting the job done.

Table 7—continued

Alpha [Old]	Scale Code	Scale Name and Question
	V046	Coordination among work units is good in DS.
	V052	People in DS will do things behind your back.
	V071	In DS, authority is clearly delegated.
	V088	Management is flexible enough to make changes when necessary.
.583	OPM16	ORGANIZATIONAL INFLUENCE ** V007, V101 reversed
	V007	When changes are made in DS, the employees usually lose out in the end.
	V101	Employees do not have much opportunity to influence what goes on in DS.
.603	OPM17	PAY AS A MOTIVATOR
	V060	The amount of money I will receive for working harder is enough to make me work harder.
	V079	I will receive more money if I work harder for DS.
.830 [.793]	OPM18D	PAY-PERFORMANCE LINK/PERFORMANCE REWARDS ** V084 reversed
	V002	Regular pay increases here depend on how well a person performs his/her job.
	V024	Promotions here depend on how well a person performs his/her job.
	V027	I will be promoted or given a better job if I perform especially well.
	V082	I will get a larger pay increase if I perform especially well.
	V084	Under the present system financial rewards are seldom related to employee performance.
	V099	I will have better job security if I perform especially well.
	V106	My own hard work will lead to recognition as a good performer.
	V029	<i>My pay is determined by my individual job performance.</i>
	V059	<i>In DS, employees receive equal pay for equal work.</i>
.805	OPM19	PAY SATISFACTION
	V008	Considering my skills and the effort I put into my work, I am satisfied with my pay.
	V081	All in all, I am satisfied with my pay.
.672 [.589]	OPM21B	RECONSIDERATION/REDRESS
	V066	In general, disciplinary actions taken in DS are fair and justified.
	V076	If I were subject to an involuntary personnel action, I believe I would be told about my grievance and appeal rights.
	V067	<i>Employees here take full advantage of their grievance and appeal rights.</i>

Table 7—continued

Alpha [Old]	Scale Code	Scale Name and Question
.767	OPM23	SATISFACTION WITH PROMOTIONS V024 Promotions here depend on how well a person performs his/her job. V027 I will be promoted or given a better job if I perform.
.531	OPM25	[SUBSCALE: OTHER WORK GROUPS] ** V038 reversed V038 In DS, conflict that exists between work units gets in the way of getting the job done. V046 Coordination among work units is good in DS.
.659	OPM26	[SUBSCALE: PERSONNEL OFFICE HELPFULNESS] ** V139, V149 reversed V137 The personnel office helps me perform my job effectively. V139 It takes too long to process the paperwork needed to fill vacancies here. V143 The personnel department here provides line management with valuable support services. V149 Supervisors in DS feel their ability to manage is restricted by unnecessary personnel rules and regulations.
.681	OPM27	SUPERVISORS: AUTHORITY V132 I have enough authority to hire competent people when I need them. V141 I have enough authority to determine my employees' pay. V146 I have enough authority to promote people. V150 I have enough authority to remove people from their jobs if they perform poorly.
.799	OPM30	SUPERVISORS: SATISFACTION ** V128, V139, V149 reversed V128 It takes too long to get decisions made in DS. V133 Top management generally supports the personnel decisions made by supervisors in DS. V137 The personnel office helps me perform my job effectively. V139 It takes too long to process the paperwork needed to fill vacancies here. V140 Supervisors here cooperate with each other for the attainment of DS's goals. V142 In DS, my organization recognizes supervisors who take the time to develop their subordinates' knowledge, skills, and abilities.

Table 7—continued

Alpha [Old]	Scale Code	Scale Name and Question
	V143	The personnel department here provides line management with valuable support services.
	V149	Supervisors in DS feel their ability to manage is restricted by unnecessary personnel rules and regulations.
.720 [.637]	OPM31B	TRAINING OPPORTUNITIES
	V035	DS gives me adequate training to do my job well.
	V092	I am given the opportunities I want to participate in training programs.
	V091	<i>I am satisfied with the chances I have to learn new things on my job.</i>

NOTE: Scales whose codes end in a letter are modified from the original OPM scales; added items are italicized.

Our Alpha Coefficients are generally comparable with those found in previous research,⁸ and the analysis generally supports the scale construction proposed by OPM. The noteworthy exceptions are the Internal Equity (OPM09) and Locking In (OPM13) scales, which yielded Alpha Coefficients below .5, and, to a lesser extent, the Organizational Influence (OPM16) and Other Work Groups (OPM25) scales, which yielded coefficients between .5 and .6. Accordingly, the items composing these four scales were analyzed individually. The anomalous result for the Internal Equity scale probably is attributable to the wording of question 87, which refers to “other directorates” rather than to “DS” as does question 48. The basis of the results for the three other scales is not clear.

Further correlational and factor analyses were performed to define additional scales for survey questions that appeared to assess similar attitudes but had not been grouped together by OPM. The questions included both OPM items and those developed by RAND for PACER SHARE. As can be seen in Table 8, the “Pay Determinants,” “Union Satisfaction,” “Organizational Involvement,” “Satisfaction with Supervision/Work Unit,” and “Supervisors’ Classification Satisfaction” groupings yielded large Alpha Coefficients, supporting the combi-

⁸For example, in the evaluation of the OPM demonstration at the Naval Ocean Systems Center.

Table 8
Additional Variable Groups: Questions and Alpha Coefficients

Alpha	Scale Code	Variable Group Name and Question
.877	PAYDETRM	Pay Determinants (How important is each in determining your pay?) V114 The quality of your job performance? V115 The quality of your work unit's performance? V116 The amount of responsibility on your job?
.862	UNIONSAT	Union Satisfaction V045 In general, I like the way the union handles things. (How satisfied are you with the efforts your union has made to get each of the following outcomes for its members?) V107 More meaningful work for members? V108 Fairer job classifications? V109 Fairer promotion policies? V110 How satisfied are you with the success your union has in bargaining non-wage issues?
.814	ORGINVOL	Organizational Involvement V010 What happens to DS is really important to me. V016 To help DS, it is necessary that I think of ways to help other sections, branches, or divisions do their jobs. V042 It is necessary for DS to minimize costs and maximize performance. V044 It is necessary for everyone in DS to help support other directorates such as Maintenance. V053 To help DS, it is necessary that I think of ways to help my section do its job. V062 I am personally responsible for helping DS improve its performance. V072 For DS to do its mission well, it is necessary for me personally to do a good job. V073 If I have ideas on how people in DS could improve their work, I should tell them. V080 It is necessary for DS to maintain high work quality and timeliness. V095 I can save money for DS by working harder or better. V097 I have ideas about how I could do a better job for DS.
.867	SUPVNUNT	Satisfaction with Supervision/Work Unit V015 My supervisor encourages subordinates to participate in important decisions. V021 My supervisor gives me adequate information on how well I am performing. V023 My supervisor has strong technical skills. V028 My supervisor demands that people give their best effort. V031 My supervisor works well with people.

Table 8—continued

Alpha	Scale Code	Variable Group Name and Question
.723	V034	My supervisor is interested in my opinion on how to improve things in DS.
	V039	My supervisor keeps informed about the way subordinates think and feel about things.
	CLASSSAT	Supervisors' Classification Satisfaction ** V145 reversed
	V032	All in all, I am satisfied with the position classification procedures in DS.
	V145	I have to devote too much time to position classification.
	V148	I have enough authority to influence classification decisions.
	V059	In DS, employees receive equal pay for equal work.
	V134	In DS jobs are classified fairly and accurately.
	.500	Union-Management Relations ** V003, V098 reversed
	V003	The union and management are hostile toward each other.
.315	V093	Management and the union are willing to try solutions that haven't been tried before.
	V098	Management is only willing to negotiate about a few specific issues.
	Supervisors' Perceptions of Grading Criteria	
	V129	My pay is based partly on the performance of the workers I supervise.
	V136	The criteria used to grade supervisory positions in DS are fair.
.532	V138	My pay level is based partly on the number and grades of the people I supervise.
	V130	Supervisors' Willingness to Recommend Staff Reductions
	V140	The work I am responsible for supervising probably could be done with fewer employees.
	V144	The work I am responsible for supervising probably could be done with fewer mid-level supervisors.

nation of the grouped items. Thus, they were treated as scales in the PACER SHARE evaluation. The remaining groupings yielded much smaller Alpha Coefficients, indicating that the responses to the combined items were more independent of each other. Consequently, the items were analyzed individually rather than combined into scales.

Evaluative Analysis. The primary survey evaluation consisted of computing and comparing the responses for each scale or individual item at Sacramento ALC and the comparison sites. For reference purposes, a summary analysis was made to determine the mean response by site for each item and scale. For scales, each participant's response was itself the mean of his or her responses to the component scale items (following any necessary polarity reversals). Given the large number of respondents and generally low rate of missing data, a participant's scale response was not counted if a response to any of the component items was missing. (Over all items, scales, and sites, missing response rates ran from 0 percent to 17 percent in the extreme; rates of 1 to 5 percent were typical.) Because supervisors were disproportionately represented in the comparison site samples, means were computed separately for supervisors and non-supervisors.

The main evaluation followed the summary analysis. It consisted of a series of ordinary least-squares (OLS) multivariate regressions on the responses of the individual survey participants. The regression specification—see MR-310/1-P&R, Appendix B—permitted responses to each item and scale at Sacramento to be compared with the responses to the same questions across the four other ALCs taken together (unweighted) and distinguished baseline, year-one, year-two, and year-three outcomes. Results were pooled for the other ALCs to reduce the effect of regional and idiosyncratic differences among ALCs, and each participant's response was weighted equally.⁹ We chose this approach because the numbers of individuals representing each ALC are both large and fairly uniform and because

⁹As was true at baseline, the overall survey response rate for Warner-Robins was lower than for the other ALCs in the comparison group. To be conservative, however, we again chose to give the same weight to each Warner-Robins respondent as to those at the three other comparison ALCs, rather than giving them extra weight to adjust for their lower response rate. As a practical matter, it may be noted that such a weighting adjustment would result in less than a five percentage point increase in the proportion of the comparison group represented by Warner-Robins. Given the similarity of the results across the ALCs, in which differences in mean scale scores are generally less than four-tenths of a point, the adjustment would be trivial, rarely amounting to more than two one-hundredths of a point on the five-point scales. Similarly, even if the attitudes of the nonparticipants varied to some extent from the respondents', the cross-ALC similarity, high participation rate, and personnel record information imply that the effect of such a difference on the survey results would be minimal.

we wish to compare the Sacramento results with those for all other DS employees.

Although the DSs at all of the ALCs perform similar missions, differences in staffing and sampling for the survey could affect the survey responses. The regression analysis controlled for supervisory status because only a sample of the nonsupervisors is selected for survey at the comparison sites, yielding a higher concentration of supervisors, whose attitudes differ from those of nonsupervisors.¹⁰ The analysis also controlled for differences in the background and demographic characteristics of the survey respondents at the different ALCs by including variables for tenure at DS, age, sex, education, and ethnicity (see Table 9). This control is necessary because demographic and other background characteristics could have implications for individual attitudes pertaining to economic incentives or organizational culture¹¹ and because those background characteristics vary with site and possibly over time and survey sample. In fact, all but a few of the variables listed in Table 9 showed statistically significant correlations with responses to at least half our items and scales, according to the survey.¹² Variation with site is obvious from Table 9; ethnicity and education level in particular vary widely. Variation with time is possible because different individuals will be surveyed at different points during the demonstration period. Part of that variation stems from the normal ebb and flow of employees; some individuals will leave each site and others will join. Another part stems from variation in sampling; for nonsupervisors at the comparison sites, each survey is administered only to a randomly selected sample, not

¹⁰Average supervisor responses differed significantly from the nonsupervisory averages ($p < .05$) for over 90 percent of the items and scales measured. (See Appendix B in MR-310/1-P&R.)

¹¹It can be argued that changes in attitudes attributable to changes in the composition of the work force during the demonstration are, after all, also attributable to the demonstration. We do not dispute that argument here. Our rationale is simply that changes in attitudes among the same or similar individuals are different from changes resulting from shifts in the demographic composition of the work force, and that the regression analysis allows us to disentangle and assess each of these effects.

¹²The exceptions: number of years under current supervisor, number of years as a federal employee, and "other" ethnicity. Blue/white-collar status, pay grade, and education (along with supervisory status) exhibited especially high frequencies of significant correlation (over 80 percent).

Table 9
Variables Controlled in the Regression Analysis
(baseline survey sample profile)

Variable	Emp. Status	Sacramento	Okla. City	Ogden	San Antonio	Warner-Robins
Number of years in DS (percent 5 yr or more) ^a	Nonsup. Superv.	48 76	53 88	45 87	49 69	58 86
Pay category (percent blue collar)	Nonsup. Superv.	48 28	53 42	43 37	51 38	49 36
Pay grade (percent above GS-8 or WG-8)	Nonsup. Superv.	18 65	20 62	19 64	19 65	20 59
Number of years as fed- eral employee (percent 10 yr or more) ^b	Nonsup. Superv.	53 77	39 78	55 89	40 74	55 91
Type of appointment (percent career)	Nonsup. Superv.	74 86	76 85	77 92	71 82	79 82
Time under current immediate supervisor (percent 1 yr or more)	Nonsup. Superv.	45 47	65 69	43 48	48 51	53 57
Membership in union (percent yes)	Nonsup. Superv.	23 6	14 2	15 5	11 2	22 3

Table 9—continued

Variable	Emp. Status	Sacramento	Okla. City	Ogden	San Antonio	Warner-Robins
Age (percent over 40)	Nonsup. Superv.	54 73	50 80	42 68	53 78	53 79
Sex (percent male)	Nonsup. Superv.	54 60	45 74	48 68	61 75	46 69
Education level (percent with some college) ^c	Nonsup. Superv.	70 75	51 61	58 71	60 71	37 52
Ethnicity (percent minority) ^d	Nonsup. Superv.	37 28	24 16	14 11	77 71	39 27

^aFor this variable, as for most of the others, respondents could choose among several response categories: less than 1 yr, 1-3 yr, 3-5 yr, over 5 yr. The nondichotomous categorical variables—pay category and appointment type—were converted to dichotomous variables as shown above for the regression analysis. For clarity of presentation, in this table only the categories for the other variables also have been aggregated into two for each variable (and employee status—supervisory or nonsupervisory). Only one of the two is shown here for each employee status; the value of the complement is, of course, 100 percent minus the value shown. For these other variables, the aggregation is based on their statistical distribution. There is no implication for greater relevance; for example, the percent with 5 yr experience is not necessarily more relevant to the demonstration than the percent with 3 yr.

^bData for this variable are for the time of the year-one survey.

^cWhether degreed or not; excludes those with technical training or apprenticeship only.

^dHispanic, black, or "other." In the regression analysis, ethnicity was represented by three dichotomous variables: white Hispanic (yes/no), black (yes/no), other (American Indian, Asian, Pacific Islander) (yes/no).

the entire population. (And because the surveys are filled out anonymously to encourage candor, establishing a longitudinal panel is not possible.) Furthermore, if the demonstration has the desired effects on productivity at Sacramento, we would expect many of the positions vacated by natural attrition to be left unfilled. This is likely to affect the demographic and background characteristics of the remaining work force. Moreover, the persons attracted to those positions that are filled may differ systematically from persons attracted to such positions before the demonstration. The regression specification allows us to compare attitudes across sites and years while accounting for the effects of such differences in work force composition.

Sources for Personnel System Measures

Like the survey measures, the personnel system measures are used to evaluate changes in organizational flexibility and quality of work life. They address such outcomes as:

- Has the skill base of the work force been expanded?
- Are pay opportunities under the demonstration being maintained or improved, particularly for junior-level personnel (while holding the total wage bill constant)? Is pay inversion between supervisors and nonsupervisors being avoided?
- Are crossovers from white-collar to blue-collar positions (and vice-versa) being avoided?
- Is the demonstration bringing about changes in the percentage or distribution of supervisors?
- Is the combination of interventions reducing turnover? Is this more true of some segments of the work force than others? Has the percentage of the career force been maintained?

The analysis uses calendar year 1987 as a baseline, April 1988–March 1989 for year one, April 1989–March 1990 for year two, and April 1990–May 1991 for year three.¹³ It is designed to detect differences

¹³The evaluation period for year three was extended slightly to capture the effects of the Reduction In Force that occurred during spring 1991.

between Sacramento and the comparison ALCs, taken together. Results are based on analysis of personnel-record information for all DS employees. Each individual observation (worker's score on a given outcome measure) is weighted equally; that is, the results are not weighted by site. Crossover and turnover results are analyzed by tests for differences in proportions. All other results are based on a series of OLS regression analyses, which include terms to distinguish the period (baseline, year one, year two, year three) and source (Sacramento, other ALC) of the observation. Supporting data and analyses are provided in Appendix C of MR-310/1-P&R.

Personnel measures fall into one of three categories, distinguished by their source and reliability: the Work Force Database, individual ALC records, and OPM survey data. Most of the personnel system measures, listed in Tables 3 and 4, come from the WFDB. These are tabulated from automated records maintained on the civilian work force by the Directorate of Civilian Personnel at Wright-Patterson Air Force Base. These data are the most complete and reliable records. They have been maintained for many years, and our own inspections of them gave us no reason to doubt the Air Force's reliability claims. Two measures, identified as "personnel records" in Tables 3 and 4, must be tabulated from records that are maintained at the individual ALCs using special audits. Finally, a third category of measures must be constructed from information collected by the OPM's Personnel Office Productivity Analysis (POPA) survey, which is to be completed quarterly during the demonstration.

Through consultation with personnel system experts at Wright-Patterson and McClellan Air Force Bases, specifications were developed to obtain reliable computerized measures from the WFDB. Obtaining reliable data for the two smaller sets of measures (the personnel record and POPA measures) has proven more difficult. Most of the record information still requires compilation. Moreover, analysis of the preliminary results raised a number of questions about the reliability of the POPA data. For these reasons, the results given in Chapter Four center on the WFDB measures analyses.

MEASURING QUALITY AND TIMELINESS OF WORK

Measures

The quality and timeliness of work are measured using data provided by the Quality (DSQ) and Management (DSM) Divisions of DS. The analysis concentrates on variables whose routine measurement has been mandated by the Air Force Logistics Command. This procedure guarantees that comparable measures cover a broad range of functions, are both quantifiable and routinely evaluated, and are available for all five ALCs.

The measures cover a broad range of work performed within DS, including supply; preservation, packaging, and packing of materiel; transportation; and inventory (see Tables 10 and 11).¹⁴ They include reports of discrepancies, which reflect errors in receipts from outside DS or in shipments made from DS; measures of timeliness in accomplishing tasks; and indicators of shipping support.

Results for each quality/timeliness indicator are analyzed using multivariate regression. The analysis tests for differences in the proportion of errors (or proportion of actions within applicable standards) at the Sacramento ALC versus the comparison sites and for changes in these differences over time, using monthly observations. The regression specification includes terms to distinguish the period and source of the outcome (as described for the personnel analyses in the previous subsection). The third-year period covers April 1990–May 1991.

Weighting and Comparison Issues

In the attitude and personnel system analyses discussed earlier, the results for each individual were given equal weight, rather than computing separate means for each of the comparison ALCs and then averaging those means. For the work quality analysis, there were two

¹⁴Although there were 11 DSQ measures collected commandwide in year one (of which eight had sufficient observations to be analyzed), directed collection was discontinued during year two. We were able to evaluate the four DS measures shown in Table 10 nonetheless, but year-three data were available only for Sacramento.

Table 10
Measures of Work Accuracy

<i>Supply</i>	
BL7:	Controlled Exceptions—A list of transactions rejected during computer input is checked to see that all such transactions have been processed accurately and timely.
<i>Preservation, Packaging, and Packing of Materiel</i>	
PL4:	Packing Process—Before sealing a shipping container, the line item and its container are checked for tagging, quantity, misselection, etc., and the accompanying documentation is checked for accuracy of record.
<i>Inventory</i>	
VL1:	Location Audit Program Survey—Locator cards, location change notices, and physical location of materiel are compared as a check on the accuracy of this survey's examination of record- location compatibility.
VL3:	Physical Count of Noncontrolled Items—The records from the count are checked against materiel locations.
Reports of Discrepancies (RODs) received: reports received of incorrect shipments from DS.	
Reports of Discrepancies (RODs) initiated: reports sent out notifying senders of incorrect shipments received into DS.	

Table 11
Measures of Receiving Timeliness and Shipping Support

Percentage of items for which receiving documents are posted within one day
Percentage of receipts binned within two days
Percentage of high-priority requisitions (lower is better)
Percentage of denials of issues due to unavailability of items originally believed to be in stock (lower is better)

issues of weighting and comparison to consider. The first dealt with the weight to be given to the observations for each ALC—in this case, quality rates reported in a given month. We had to be careful to make sure that if quality improved in a particular work area, the pe-

riodicity with which the associated DSQ indicator was assessed was not reduced. If this pattern were shown by the baseline data, then the quality of work for the comparison group would be understated by equal weighting of each observation, because the ALCs with the best quality would have fewer observations.

Second, to allow a sufficient number of monthly observations for meaningful baseline data, the baseline period was defined as 1985 to 1987. The plan to have the baseline cover other years in addition to 1987 raised a second consideration: verification that the pattern of results at Sacramento for 1987 relative to the results at other ALCs was similar to the 1985-1986 pattern of results for the two groups.

Both issues pertain to the DSQ data. The number of observations per ALC is considerably less variable for the DSM data, so only the second issue is relevant there.

To investigate these issues, multivariate regression analyses were performed on the DSQ and DSM data for 1985 to 1987.¹⁵ Overall, the analyses support the use of equal weighting for the monthly observations and the combination of the 1987 observations with those for the earlier period.

First, the DSQ data do not show inverse correlation between quality of work and frequency of measurement. Of the 13 indicators assessed, two (RODs) had identical numbers of observations for the comparison ALCs. Among the remaining 11, the (correlational) relationship between the number of observations for the ALC and the quality level for the ALC was evenly split. In six instances ALCs with better quality rates had fewer observations, and in five instances they had more observations.

Second, the pattern of results for the Sacramento ALC in relation to the comparison group did not differ systematically between the 1985-1986 period and 1987. For 11 of the 13 baseline DSQ measures, the Sacramento data show the same relationship to the comparison

¹⁵Appendix D in N-3146-FMP gives the regression results and annual rates for each measure over the three-year period.

group data across the two periods.¹⁶ There are six DSM baseline measures. In all six cases, the pattern of results for Sacramento relative to the comparison ALCs is the same across the two time periods.¹⁷

PRESENTATION OF RESULTS

The next four chapters present the results of our analyses. Findings on organizational flexibility and quality of work life are discussed in Chapter Three (based on the attitude survey results) and Chapter Four (the personnel measure results). Chapter Five covers findings on work quality. Chapter Six describes the results of our cost savings analysis. Our conclusions are discussed in Chapter Seven.

¹⁶In terms of the sign and significance level of the regression coefficients for Sacramento relative to those for the comparison group, as shown in Table D.1 of N-3146-FMP. The exceptions are PL4 and SL4.

¹⁷See Table D.2 of N-3146-FMP.

Chapter Three

ORGANIZATIONAL FLEXIBILITY AND QUALITY OF WORK LIFE: ATTITUDE SURVEY RESULTS

In Chapter Two, we discussed the methods and data we used to evaluate the outcomes of the PACER SHARE Demonstration Project. We now present the results of the third-year evaluation and contrast them with those at baseline (i.e., predemonstration). As described in Chapter 2, outcomes will be evaluated using four types of measures: (1) survey results, (2) personnel system records, (3) work quality indicators, and (4) measures of costs and production. We begin with results from the survey analysis. Here, the baseline period corresponds to the administration period of the baseline surveys between November 1987 and March 1988; the year-three surveys were given in spring 1991.

The survey is an important tool for evaluating the effectiveness of the PACER SHARE interventions in achieving the demonstration's goals of improving the quality of work life and organizational flexibility. The baseline survey demonstrated substantial variation in attitudes toward the work environment, depending on the specific aspects measured. But without question, the primary area of disapproval concerned pay and promotion practices (i.e., extrinsic rewards). Measures of the organizational climate within DS also reflected unfavorable ratings. In contrast, measures of job and intrinsic satisfaction were either generally favorable or included some favorably rated items.

Baseline attitudes toward existing conditions and personnel practices generally were less favorable at Sacramento ALC than in the

comparison group. This could reflect a long-standing difference that existed well prior to PACER SHARE. However, evidence suggests that satisfaction with existing conditions and practices decreased as PACER SHARE was developed and its details and purposes were explained to the work force.¹

The survey analysis for year three is intended to reveal changes in attitudes at Sacramento (relative to the comparison group) toward the quality of work life and organizational flexibility. We found that attitudes toward pay-related attributes have tended to worsen. Changes at Sacramento were similar to those for the comparison group. This similarity of outcomes is new, since in the first two years pay-related attitudes worsened at Sacramento relative to the other sites. The similarity may be attributable to reduced concerns about the way pay and promotion are handled under the revised base pay determination procedures, relative to earlier years. Attitudes toward nonpay-related variables generally improved, showing substantial positive change relative to those of the comparison group.

ATTITUDE MEASURES IN THE EVALUATION MODEL

The evaluation model for PACER SHARE (see Chapter Two) includes numerous attitudinal measures designed to capture changes in attitudes during the demonstration. Analyses compare the extent of such changes at Sacramento with changes at the other ALCs during the same time period. The next four tables specify the particular scales and individual questions analyzed for each instance in which an attitude measure was listed in Table 3. The order of presentation and labeling are the same. For example, for intervention "I," job series and grade consolidation, expected effect "A" refers to a simplified job classification process. Measure "5" for IA consists of employee perceptions of the classification process. Specifically, measure 5 consists of supervisors' responses to scale CLASSSAT (a supervisory scale) and nonsupervisors' responses to questions 32 and 59 (the two questions in CLASSSAT also answered by nonsupervisors).

¹See R-3753-FMP.

For each scale and variable in the four tables, several types of results may be seen. The first column of numbers indicates the mean (average) of the survey participants' responses for the attitude measure at Sacramento ALC at baseline.

The second, third, and fourth columns in the four tables represent OLS regression coefficients.² The coefficient in column two expresses the direction and extent of the baseline difference of the Sacramento attitude level from the attitude level of DS employees at the other ALCs, controlling for differences in the demographic composition and experience of DS employees at the different sites. Significant differences between the attitudes of the Sacramento and comparison site DS work forces (i.e., $p < .05$) are indicated by asterisks. This column thus tests the hypothesis that the predemonstration attitude expressed at Sacramento is the same as the attitude expressed at the other ALCs.

The first two columns give a picture of the attitudes of DS employees at Sacramento and in the comparison group at baseline. Attitude *levels*, however, are not the focus of this evaluation. The goal of the demonstration is to *improve* quality of work life and organizational flexibility (among other things), so our emphasis is on change. Change is taken up in columns three and four.

Column three of the four indicates the estimated change in the mean score for the scale or question at the comparison sites after the first three years of the demonstration, as assessed by the year-three survey and compared with their mean score at baseline. The hypothesis tested—and the expectation, given nonparticipation in PACER SHARE—is that the attitude expressed in the comparison group in year three is the same as that expressed there at baseline.

Column four shows the estimated third-year change in mean score at Sacramento. The *difference from the change* in mean score for that scale or variable at the other sites is obtained by subtracting column three from column four. This is the key number, for it tests the hypothesis that the change in attitude at Sacramento is the same as the

²The regression coefficients are taken from Appendix B of MR-310/1-P&R, which also discusses the terms in the regression model.

change in attitude in the comparison group. That is, that the demonstration had no effect on the attitude.

For example, for measure I.A.5, scale CLASSSAT assesses supervisors' attitudes toward the job classification process. The results in Table 12 indicate that at the Sacramento ALC the mean response to the items in CLASSSAT was 2.56 at baseline. The five-point survey response scales consisted of 1 = strongly disagree, 2 = disagree, 3 = undecided, 4 = agree, 5 = strongly agree. Thus, as can be seen by examining the items in CLASSSAT (see Table 7), a mean response of 2.56 indicates that, on average, Sacramento respondents tended to disagree that the existing classification process was satisfactory.

The second number for I.A.5 in Table 12 is $-.28$. Because site is denoted by a dummy variable that takes the value 1 for Sacramento (and 0 otherwise), the coefficient $-.28$ indicates that the mean response on CLASSSAT at Sacramento at baseline was $.28$ lower than at the other ALCs, after adjusting for differences in the composition of the work forces. In other words, even if the comparison ALC work force had the same demographic and experience composition as the Sacramento DS work force, we would expect its mean response on CLASSSAT to differ (to equal 2.84, i.e., $2.56 + .28$). The asterisk indicates that the attitude difference between Sacramento and the comparison group is statistically significant. This result thus constitutes a rejection of the hypothesis that Sacramento's pre-demonstration attitude toward the classification process was the same as that of the comparison group.

In column three, we observe the change in people's attitude three years later at the comparison sites. This change was only $-.06$, indicating no significant change (i.e., $2.84 + -.06 = 2.78$). That is, we cannot reject the hypothesis that the attitude in the comparison group in year three was the same as at baseline.

We are especially interested in the unique way in which Sacramento attitudes changed *as compared with attitude changes at the other sites*. The change at Sacramento is shown in column four, where we observe that Sacramento showed a gain of $.21$ at the end of year three. By comparing columns three and four, we see that this represents an *additional* change of $.27$ above the $-.06$ at the other sites ($.21 - -.06 = .27$). The asterisk for the $.21$ figure indicates that the *differ-*

Table 12
Survey Results Relating to Job Series and Grade Consolidation

Evaluation Model Measure: Scales and Individual Items		Sacramento Baseline Mean Rating	Regression Coefficient		
			Sacramento Baseline Diff. from Other ALCs	Year 3 Change for Other ALCs	Year 3 Change at Sacramento
I A Simplified job classification process					
	B Improved responsiveness to work/mission requirements through increased flexibility in making assignments to workload				
	C Expanded career and training opportunities/job enrichment				
	D Reduced need for promotions				
A5	EMPLOYEE PERCEPTIONS OF CLASSIFICATION PROCESS				
CLASSSAT	Supervisors: Classification Satisfaction	2.56	-.28*	-.06	.21*
V32	Satisfaction with classification (nonsupervisors)	2.22	-.29*	-.01	.17*
V59	Equal pay for equal work (nonsupervisors)	1.94	-.21*	-.03	-.05
B1	PERCEIVED FLEXIBILITY BY SUPERVISORS				
V131	Staffing flexibility	2.46	-.16	.04	.14
C2	INTRINSIC WORK SATISFACTION				
OPM11	Intrinsic Work Satisfaction	3.02	-.33*	-.10*	.13*
OPM31B	Training Opportunities	2.59	-.40*	-.04	.26*
C3	SATISFACTION WITH CAREER OPPORTUNITIES				
V20	Satisfied with opportunities for advancement	1.98	-.26*	-.29*	.03*
D2	SATISFACTION WITH PROMOTIONS				
OPM23	Satisfaction with Promotions	2.18	-.19*	-.24*	-.21
V102	Competition fair	1.98	-.16*	-.08*	.19*

NOTE: An asterisk in column two or three indicates the coefficient is significant at the $p < .05$ level; in column four, it indicates the difference in the coefficients for columns three and four is significant at $p < .05$.

ence in the change (.27) was statistically significant. Thus, we can reject the hypothesis that the Sacramento third-year change in attitude from baseline was the same as the amount of change that occurred at the other ALCs. We now turn to the results, by intervention.³

Job Series and Grade Consolidation

Baseline. Across the ALCs, respondents expressed dissatisfaction⁴ with advancement and promotion opportunities and with the existing classification process. Supervisors tended to feel they did not have sufficient flexibility in making job assignments to meet workload changes. Respondents in the comparison group tended to be satisfied with the intrinsic rewards of their jobs, whereas those at the Sacramento ALC were neutral. Sacramento respondents expressed less satisfaction with existing job classification procedures, advancement opportunities, and promotion practices than their counterparts at the other ALCs and expressed less intrinsic work satisfaction (i.e., were less likely to say their jobs were meaningful or challenging or that they received desired training). Perceived flexibility in making job assignments to meet workload requirements (among supervisors) did not differ significantly between Sacramento and the comparison group.

Year Three. As can be seen in column three of Table 12, at the year three follow-up there was little change in attitudes toward the classification process or staffing flexibility at the comparison ALCs. However, intrinsic satisfaction and, especially, satisfaction with advancement and promotion declined significantly.

Column four shows that there was a substantially different, positive pattern of attitude change at Sacramento relative to that at the other ALCs. Perceptions of the classification process and staffing flexibility generally improved relative to the other sites, in two cases

³Mean response values for each survey item and scale are given for each ALC, for supervisors and nonsupervisors, in Appendix B of MR-310/1-P&R.

⁴In this qualitative summary, ratings of about 2.8 or less are taken to be "low," "unfavorable," or indicating "dissatisfied" respondents; ratings of about 3.2 or more are taken to be "high," "favorable," or indicating "satisfied" respondents; ratings between 2.8 and 3.2 are taken as indicative of an "undecided" or "neutral" response.

(CLASSSAT and V32) significantly. Moreover, all but one measure of intrinsic satisfaction and satisfaction with career and advancement opportunities (OPM23) showed statistically significant positive change relative to the other ALCs.

Revised Base Pay Determination

Baseline. Across the ALCs, almost all aspects of pay and promotions in IIB2–IIB4 were rated unfavorably (see Table 13). Perceived pay equity for blue- and white-collar jobs, for jobs within DS, and between DS and other employers was lower among Sacramento ALC respondents. Sacramento employees also expressed less satisfaction with pay and promotions. In contrast, they were more likely to believe that if they worked harder they would be compensated for their effort (OPM17). There were no significant differences across ALCs in perceptions of the roles of work quality, responsibility, and length of service in determining pay (PAYDETRM and V117).

Year Three. For the most part, attitudes at the comparison sites worsened over the three-year period. Eight of 14 measures showed significant deterioration relative to baseline (as indicated by the asterisks), whereas only one showed improvement (V64). Measures of pay satisfaction (OPM19), the clarity of pay decisions (PAYDETRM and V12), and pay equity (OPM04 and V87) showed smaller changes.

As can be seen in column four, Sacramento's attitudes changed similarly. This represents a different pattern from that seen in earlier years, when attitudes at Sacramento had worsened significantly relative to other ALCs'. Of the 14 measures in Table 13, only four showed differential change at Sacramento relative to the comparison sites. Among these, perceptions of pay as a motivator (OPM17) and internal pay equity (V87) declined relative to the other sites, whereas satisfaction with advancement opportunities (V20) and the perceived fairness of job competition (V102) improved.

Revised Supervisory Grading Criteria

Baseline. Supervisors generally rated grading criteria unfavorably, and felt that their pay tended to be based on the number and grades of the subordinates they supervised more than on their job responsi-

Table 13
Survey Results Relating to Revised Base Pay Determination

Evaluation Model Measure: Scales and Individual Items		Sacramento Baseline Mean Rating	Regression Coefficient		
			Sacramento Baseline Diff. from Other ALCs	Year 3 Change for Other ALCs	Year 3 Change at Sacramento
II	A Increased comparability of pay for GS and WG workers B Increased pay satisfaction				
A3	BLUE/WHITE COLLAR INEQUITY				
	V64 Make more in blue-collar jobs	3.63 ^a	.51*	-.18*	-.12
B2, B3	EXTRINSIC REWARD SATISFACTION, PAY SATISFACTION				
	OPM17 Pay as a Motivator	2.41	.09*	-.15*	-.31*
	OPM18D Pay-Performance Link/Performance Rewards	2.27	-.19*	-.17*	-.20
	OPM19 Pay Satisfaction	2.52	-.22*	-.03	.05
	OPM23 Satisfaction with Promotions	2.18	-.19*	-.24*	-.21
	PAYDETRM Pay Determinants	2.86	-.08	-.03	-.11
	V6 Present rewards not motivating	3.44 ^a	.11*	.18*	.18
	V12 Pay decisions clear	2.76	-.21*	.00	-.01
	V20 Satisfied with opportunities	1.98	-.26*	-.29*	.03*
	V102 Competition fair	1.98	-.16*	-.08*	.19*
	V117 Tenure determines pay	2.68	-.03	.12*	.05
B4	PERCEIVED EQUITY (Internal, External)				
	OPM04 External Equity	2.62	-.32*	-.05	-.09
	V48 DS pay differences fair	2.49	-.24*	-.13*	-.19
	V87 Pay fair vs. other directorates	2.82	-.03	-.01	-.13*

NOTE: An asterisk in column two or three indicates the coefficient is significant at the $p < .05$ level; in column four, it indicates the difference in the coefficients for columns three and four is significant at $p < .05$.

^aHigher rating reflects less desirable outcome.

bilities or the quality of their work (V138 and PAYDETRM; see Table 14). Also, they tended to disagree that the work they supervised could be handled with fewer staff. Supervisors' perceptions of the influence of various grading and pay level criteria (V138, V117, and PAYDETRM) on their jobs generally did not differ between Sacramento and the comparison ALCs. The exception was that supervisors expressed less overall satisfaction with the grading criteria (V136) at Sacramento ALC. Supervisors at the other sites were much less likely than those at Sacramento to say that the work they supervised could be accomplished with fewer subordinates or mid-level supervisors.

Year Three. At the other ALCs, supervisors' attitudes assessed by these measures showed mixed changes over the three-year period. The perceived feasibility of staff reductions increased (V130 and V144), and the perception that supervisory pay is based on the number and grades of subordinates declined (V138). In contrast, the perceived fairness of supervisory grading criteria (V136) and link between job responsibilities and pay (PAYDETRM) declined. The two remaining measures did not change significantly relative to baseline.

Changes at Sacramento were mixed relative to those at the comparison sites. Supervisors' perceptions that their pay is based on the number and grades of their subordinates (V138) declined by an additional 1.29 points relative to the overall decline at the other ALCs (−.23). This perception is consistent with the goals of the intervention—to base supervisory pay on responsibilities rather than on the number of people supervised. Notwithstanding this change, supervisors became less likely to indicate that the work they supervised could be accomplished with fewer staff members (V130 and V144). Given the very large decline in perceived linkage between the number of subordinates supervised and pay, supervisors' increased resistance to staff reductions may simply reflect the substantially greater decline in the size of the work force at Sacramento over the three years, as compared with the other ALCs.

Productivity Gainsharing

Baseline. Sacramento respondents generally disagreed that cost savings achieved by DS through their efforts would be shared with

Table 14
Survey Results Relating to Revised Supervisory Grading Criteria and Gainsharing

Evaluation Model Measure: Scales and Individual Items		Sacramento Baseline Mean Rating	Regression Coefficient		
			Sacramento Baseline Diff. from Other ALCs	Year 3 Change for Other ALCs	Year 3 Change at Sacramento
III:	REVISED SUPERVISORY GRADING CRITERIA				
	A Less disincentive for supervisors to reduce staff				
	B Increased dependence of pay level on job responsibilities				
A1	SUPERVISORS' PERCEPTIONS OF GRADING CRITERIA				
	V136 Supervisory grading fair	2.54	-.35*	-.18*	.04
	V138 Pay based on number and grades of subordinates	3.64 ^a	-.09	-.23*	-.152*
A2	SUPERVISORS' WILLINGNESS TO RECOMMEND STAFF REDUCTIONS				
	V130 Work supervised requires fewer employees	2.47	.34*	.19*	-.17
	V144 Work supervised requires fewer mid-level supervisors	2.96	.56*	.44*	-.15*
B2	SUPERVISORS' PERCEPTIONS OF PAY LEVEL DETERMINATION				
	PAYDETRM Pay Determinants	3.26	-.13	-.16*	-.28
	V117 Tenure determines pay	2.50	-.12	-.06	.05
V:	GAINSHARING				
	A Link bonus pay with organizational performance				
A3	PERCEIVED LINK BETWEEN ORGANIZATIONAL PERFORMANCE AND BONUS PAY				
	V36 If DS saves money, shared	2.75	.64*	-.05	.65*

NOTE: Asterisk in column two or three indicates the coefficient is significant at the $p < .05$ level; in column four, it indicates the difference in the coefficients for columns three and four is significant at $p < .05$.

^aHigher rating reflects less desirable outcome.

them. Even so, employees at Sacramento ALC were much more likely to say that cost savings would be shared than were those at the other ALCs.

Year Three. There was little change in attitudes toward gainsharing (V36) at the comparison sites during the first three years of the demonstration. Attitudes at Sacramento improved significantly, however, probably from the gainshares paid. The average rating on this measure rose to 3.40 (2.75 + .65), reflecting strong agreement that organizational savings would be shared. There was strong disagreement with this notion at the other sites (a rating of 2.06), where, of course, there was no expectation that gainshares might be paid.

Combination of Interventions

Baseline. Overall, respondents were (1) undecided about the usefulness of quality measures, (2) dissatisfied with staffing flexibility, (3) undecided about their intention to leave DS, (4) dissatisfied with the organizational climate but personally committed to DS, (5) somewhat satisfied with their ability to control their work but dissatisfied with their control over DS, (6) dissatisfied with union-management relations, (7) unfavorable toward the adequacy of work group functioning, (8) satisfied overall with their jobs and their meaningfulness, (9) dissatisfied with pay and promotion practices and undecided about training opportunities, (10) dissatisfied with the help received from the personnel office, and (11) undecided about the adequacy of supervision (see Table 15). Sacramento respondents expressed significantly less satisfaction in almost all these areas.

Year Three. Column three of Table 15 indicates that about half the attitudes worsened at the comparison sites while the other half did not change significantly during the three-year period (21 vs. 19 measures, respectively). Only two (turnover-related) measures changed for the better (V47 and V83), which may reflect a difficult external job market as much as job commitment. In terms of both the magnitude of the changes and the preponderance of negative outcomes, satisfaction with extrinsic rewards showed the largest decline.

Overall, attitudes at Sacramento improved relative to those at the comparison sites or changed commensurately (22 and 17 measures,

Table 15
Survey Results Relating to the Combination of Interventions

Evaluation Model Measure: Scales and Individual Items		Sacramento Baseline Mean Rating	Regression Coefficient		
			Sacramento Baseline Diff. from Other ALCs	Year 3 Change for Other ALCs	Year 3 Change at Sacramento
VI	A Improved productivity D Reduced turnover E Improved organizational climate				
A2	EFFECTIVENESS, VALIDITY OF QUALITY MEASURES				
	V78 Quality programs helpful	2.89	-.22*	.02	-.06
A3	SUPERVISORS' PERCEPTIONS OF ABILITY TO MEET WORKLOAD CHANGES				
	VI131 Staffing flexibility	2.46	-.16	.04	.14
D3	TURNOVER INTENTION				
	OPM08 Intent to Turnover	3.00 ^a	.26*	.08*	-.05*
	V30 Could find same pay outside	3.08 ^a	.29*	.02	.03
	V47 Hard to leave job	3.18	-.08	.09*	-.04*
	V83 Too much at stake to change jobs	2.96	.04	.14*	.19
E1	ORGANIZATIONAL CLIMATE/INVOLVEMENT				
	OPM15 Organizational Climate	2.31	-.32*	-.06*	.14*
	OPM21B Reconsideration/Redress	2.76	-.19*	-.02	.14*
	OPM30 Supervisors: Satisfaction	2.57	-.42*	-.17*	.10*
	ORGINVOL Organizational Involvement	3.69	-.11*	.01	.02
	V40 Management concerned about me	1.99	-.37*	-.12*	.19*
	V56 Tell supervisors how to improve subordinates' work	2.83	-.11*	.00	.08

Table 15—continued

Evaluation Model Measure: Scales and Individual Items		Sacramento Baseline Mean Rating	Regression Coefficient		
			Sacramento Baseline Diff. from Other ALCs	Year 3 Change for Other ALCs	Year 3 Change at Sacramento
VI	E Improved organizational climate F Increased job satisfaction				
E3	ORGANIZATIONAL INFLUENCE				
	OPM02 Control Over Work	3.02	-.27*	-.03	.16*
	V7 When changes, employees lose	3.64 ^a	.34*	.13*	-.04*
	V101 Employees can't influence DS	3.86 ^a	.20*	.03	-.30*
E4	UNION-MANAGEMENT RELATIONS				
	UNIONSAT Union Satisfaction	2.41	-.16*	.00	-.12*
	V3 Union and management hostile	3.02 ^a	-.14*	.05	-.22*
	V93 Management and union try solutions	2.60	-.05	.00	.06
	V98 Management negotiates few issues	3.61 ^a	.18*	.10*	-.08*
E5	GROUP FUNCTIONING/TEAMWORK				
	OPM07 Group Functioning	2.98	-.20*	-.06*	.20*
	OPM14 Open Group Process	2.61	-.17*	-.06*	.32*
	V38 Work unit conflicts	3.81 ^a	.29*	.05	-.19*
	V41 Tell co-worker work harder	2.76	-.05	.05	.07
	V46 Work unit coordination good	2.42	-.35*	.00	.27*
F1	JOB SATISFACTION				
	OPM12 Job Satisfaction	3.32	-.26*	-.11*	.09*

Table 15—continued

Evaluation Model Measure: Scales and Individual Items		Sacramento Baseline Mean Rating	Regression Coefficient		
			Sacramento Baseline Diff. from Other ALCs	Year 3 Change for Other ALCs	Year 3 Change at Sacramento
VI	F Increased job satisfaction G Increased Personnel Office support H Improved supervision				
F2	EXTRINSIC REWARD SATISFACTION				
OPM17	Pay as a Motivator	2.41	.09*	-.15*	-.31*
OPM18D	Pay-Performance Link/Performance Rewards	2.27	-.19*	-.17*	-.20
OPM19	Pay Satisfaction	2.52	-.22*	-.03	.05
OPM23	Satisfaction with Promotions	2.18	-.19*	-.24*	-.21
PAYDETRM	Pay Determinants	2.86	-.08	-.03	-.11
V6	Present rewards not motivating	3.44 ^a	.11*	.18*	.18
V12	Pay decisions clear	2.76	-.21*	.00	-.01
V20	Satisfied with advancement opportunities	1.98	-.26*	-.29*	.03*
V102	Job competition fair	1.98	-.16*	-.08*	.19*
V103	Satisfied with job security	3.31	-.03	-.43*	-.45
V117	Tenure determines pay	2.68	-.03	.12*	.04
F3	INTRINSIC REWARD SATISFACTION				
OPM11	Intrinsic Work Satisfaction	3.02	-.33*	-.10*	.13*
OPM31B	Training Opportunities	2.59	-.40*	-.04	.26*
G1	EMPLOYEE PERCEPTIONS				
OPM26	Supervisors: Personnel Office Helpfulness	2.44	-.41*	-.17*	.31*
H1	SATISFACTION WITH SUPERVISION				
OPM06	General Supervision/Direction	2.96	-.30*	-.06*	.15*
SUPVNUNT	Satisfaction with Supervision/Work Unit	2.83	-.25*	-.05	.18*
V1	Know whether work satisfactory	3.81	-.02	-.10*	-.12

NOTE: An asterisk in column two or three indicates the coefficient is significant at the $p < .05$ level; in column four, it indicates the difference in the coefficients for columns three and four is significant at $p < .05$.

^aHigher rating reflects less desirable outcome.

respectively). The pattern depends somewhat on the area of measurement. The most consistent pattern of improvement occurred on measures of organizational climate (VI E), where 13 of 18 measures showed significant improvement relative to the other ALCs, and four of five remaining measures changed similarly. The least improvement occurred with respect to reward system satisfaction (VI F2), where two measures improved, one worsened, and eight changed comparably across sites. Overall, only three, isolated measures indicated worsening attitudes relative to the other ALCs (V47, UNIONSAT, and OPM17).

ADDITIONAL ATTITUDE MEASURES

Tables 12–15 include only those scales and questionnaire items pertaining to the evaluation model. Some of the variables we analyzed were not included in the model. We did not hypothesize *a priori* that these variables would be affected by PACER SHARE. We analyzed them nevertheless because they are important indicators of attitudes toward work, and any changes in them that could be associated with the demonstration would provide useful information. The scales, questions, and results for baseline and year three are shown in Table 16.

Baseline

The first four rows of the table show results for four OPM scales involving extrinsic reward importance, intrinsic reward importance, expectancy, and adequacy of authority among supervisors. The data indicate that at baseline extrinsic and intrinsic rewards were both rated as being very important—indeed, extrinsic reward importance received the highest mean rating of any scale—and that hard work was expected to lead to good job performance. They also indicate that supervisors felt they needed more authority in making decisions concerning their subordinates. In each case, the Sacramento ratings were lower.

The remaining portion of the table shows results for various other questions. The results are more mixed. Respondents tended to feel

Table 16
Regression Results for Additional Attitude Measures Not Referenced in Evaluation Model

Scale Code/ Question Number	Scale Name/Question Content	Sacramento Baseline Mean Rating	Regression Coefficient		
			Sacramento Baseline Diff. from Other ALCs	Year 3 Change for Other ALCs	Year 3 Change at Sacramento
OPM05B	Extrinsic Reward Importance	4.20	-.11*	.00	.00
OPM10	Intrinsic Reward Importance	4.06	-.07*	-.04	-.12*
OPM03B	Expectancy	3.36	-.16*	-.10*	.01*
OPM27	Supervisors: Authority	2.25	-.34*	-.25*	-.23
V9	High performers tend to stay with DS	2.57	-.19*	.10*	-.03*
V63	Low performers tend to leave DS	2.21	-.26*	-.07*	.00
V37	I will be demoted or removed from my position if I perform my job poorly	2.69	-.22*	-.06	-.20*
V51	I will be given simpler work or less work if I perform my job poorly	2.63	.08*	.05	.01
V119	Please rate the amount of effort you put into work activities during an average workday	4.09	-.06*	-.04*	-.06
V65	New employees in DS are well qualified for their jobs	2.28	-.18*	.00	.20*
V69	I have all the skills I need in order to do my job	3.52	-.28*	-.06	-.06
V104	I would prefer not to receive an annual performance appraisal from my supervisor	2.95	-.07	.48*	.12*
V135	Without performance appraisal it would be more difficult to reward or discipline employees (supervisors only)	2.92	-.22*	-.73*	-.30*

Table 16—continued

Scale Code/ Question Number	Scale Name/Question Content	Sacramento Baseline Mean Rating	Regression Coefficient		
			Sacramento Baseline Diff. from Other ALCs	Year 3 Change for Other ALCs	Year 3 Change at Sacramento
V147	The current system enables me to help the people I supervise improve their performance	3.27	-.21*	-.18*	.07
V26	If I had the chance, I would take a different job within DS	3.57	-.02	.08*	-.22*
V111-V113	If I took a new job, I would do so to gain: (Mark 3 of 12)				
	More responsibility	.26	.00	-.05*	-.06
	Better pay	.77	-.03*	-.02	.01
	More job security	.19	-.02	.11*	.15*
	Better supervisors	.16	.00	-.02*	-.06
	More interesting work	.38	.07*	-.02	-.07
	More important program	.07	-.01	-.01	-.01
	Better working conditions	.19	.03*	-.02	-.08*
	More convenient office hours	.05	.00	.00	.00
	Better promotion opportunities	.62	-.04*	-.05*	-.04
	More congenial colleagues	.04	-.01	-.01	.00
	Better geographical location	.04	.00	.00	.03*
	Better benefits	.16	.02	.02	.06*
V127	How important to you are your chances for obtaining a "career" position?	4.01	-.26*	-.03	.03
V118	Would you be willing to serve as a member of a union-management committee? (1=yes, 2=no)	1.63	-.02	-.02	-.07*

NOTE: An asterisk in column two or three indicates the coefficient is significant at the $p < .05$ level; in column four, it indicates the difference in the coefficients for columns three and four is significant at $p < .05$.

that performance was not related to turnover or to work assignments, new employees were not well qualified, they would take a different job in DS if they could, and they would be unwilling to serve on a union-management committee. They were undecided about the utility of performance appraisals. In contrast, respondents were likely to agree that they worked hard and had the skills they needed. Supervisors tended to feel that the existing system enabled them to improve their subordinates' performance, and there was general agreement that securing a "career" position was important.⁵ Consistent with the discussion of Tables 12-15, the most common reasons for taking a new job were to secure better pay and better promotion opportunities, which were included as one of the three most important reasons by 77 and 62 percent of the respondents, respectively. Getting more interesting work was the next most common reason, but was mentioned by a much smaller percentage of the respondents (38 percent). The remaining reasons were mentioned by still smaller percentages.

Generally, Sacramento ALC respondents were less inclined to agree with the statements, indicating less favorable attitudes toward existing conditions. Sacramento respondents were no more likely to want to change jobs within DS or to be willing to serve on a union-management committee. Also, for the most part they did not have different reasons for potential job turnover. Among 12 reasons assessed, only three differed significantly in the frequency with which they were rated as being among the most important reasons. Sacramento respondents were more likely to say they would take a new job to get more interesting work and less likely to say they would do so for better pay or promotion opportunities.

Year Three

There were mixed changes in attitudes on these measures at the comparison ALCs during the three-year period. Respondents were less likely to agree that hard work or innovation led to good job performance or co-worker recognition (OPM03B) or to say they worked

⁵Securing a career position was significantly more important to those without a career position.

hard (V119); the perception that high performers remain in DS increased, but the perception that low performers leave declined (V9 and V63, respectively); support for performance appraisals declined (V104 and V135) as did the perception that the current system allows supervisors to improve their subordinates' performance (V147); and respondents became more likely to say they would take a different job in DS (V26). More responsibility, better supervision, and better promotion opportunities declined as reasons for turnover, whereas improved job security became more prominent. This last result may well be related to the RIF in spring 1991.

Differences in changes at Sacramento were mixed. Relative to changes at the other ALCs, the importance of intrinsic rewards declined (OPM10); the expectation that hard work or innovation leads to good performance increased (OPM03B) as did the perception that new employees are qualified (V65); however, the perception that high performers stay with DS declined (V9), as did the perceived consequences of poor job performance (V37); support for performance appraisals did not decline as much as at the other ALCs (V104 and V135); respondents became less likely to say they would serve on a union-management committee (V118); they also were less likely to say they wanted another job in DS. Better job security, geographical location, and benefits became more prominent as potential reasons for leaving, whereas working conditions declined as a reason for turnover relative to the other ALCs.

RESULTS FOR NEW MEASURES

Table 17 gives regression results for 16 new attitude questions added to the survey in year one at the request of the sponsor. The questions can be grouped into four areas: information use/feedback, quality circles, team building, and miscellaneous. The factor analysis underlying this grouping was discussed in N-3257-FMP.

Year One

At the first-year survey point, attitudes in these areas generally were unfavorable at Sacramento. The exception concerned quality circles, particularly the opportunity to participate in them. With few excep-

Table 17
Survey Results by Attitude Area for New Items

Measure		Sacramento Year 1 Mean Rating	Regression Coefficient		
			Sacramento Year 1 Diff. from Other ALCs	Year 3 Change for Other ALCs	Year 3 Change at Sacramento
INFORMATION USE/FEEDBACK					
V228	Receive help needed	3.19	-.23*	-.02	.12*
V229	Decisions support DS	3.08	-.33*	-.01	.09
V230	New knowledge used	2.57	-.40*	-.05	.18*
V239	Mission ideas shared	2.59	-.19*	.00	.44*
V241	Supervisory ideas shared	2.24	-.26*	-.12	.25*
V242	Participative employees hired	2.74	-.26*	-.17*	.05*
V243	Flexibility for supervisory positions	2.68	-.21*	-.14*	.03*
QUALITY CIRCLES (QC)					
V231	Can participate in quality circles	3.63	.72*	.02	.10
V232	QCs share ideas, improve work	3.10	.04	.02	.19*
MISCELLANEOUS ITEMS					
V237	Supervisors share performance data	2.62	-.17*	-.07	.23*
V235	Participative employees promoted	2.90	-.23*	-.08*	-.10
TEAM BUILDING					
V233	Stressed in day-to-day operations	2.67			.59*
V234	Improved relationship with supervisor	2.59			.22*
V236	Supported by division	3.01			.59*
V238	Improved peer relationships	2.71			.25*
V240	Helped communication between sections	2.57			.31*

NOTE: For team building, an asterisk indicates coefficient is statistically significant at $p < .05$; for other areas, asterisk in column two or three indicates the coefficient is significant at $p < .05$, or, in column four, that the difference between the coefficients in columns three and four is significant at $p < .05$.

tions, attitudes were significantly less favorable than at the other ALCs, where they tended to be neutral (i.e., in the 3.0 range). Attitudes toward team building could not be assessed at the other ALCs because the concept was implemented at Sacramento alone. As discussed earlier, it is likely that the lower ratings at Sacramento are accounted for by sensitization of the work force to alleged deficiencies in the existing system, which occurred just before the innovations were implemented. As would be expected, the perceived opportunity to participate in quality circles was significantly greater at Sacramento.

Year Three

There was some deterioration in the attitudes assessed by these measures at the other ALCs between years one and three. Respondents were less likely to agree there is openness to ideas concerning DS procedures and plans (V241), that participative employees are the ones hired (V242) or promoted (V235), or that there is adequate staffing flexibility for supervisory positions (V243). In contrast, most of the measures showed substantial improvement at Sacramento. Team-building measures in particular showed large positive shifts in attitude, generally on the order of one-quarter to one-half point on the five-point scale. Eight of the 11 other scales showed significant gains relative to the comparison sites, and none worsened.

SUMMARY

A broad series of responses indicates that perceptions of the quality of work life improved significantly during the first three years of PACER SHARE.⁶ Satisfaction with supervision and co-worker inter-

⁶To view the overall pattern of attitudes more clearly, we performed a factor analysis on the scales to group scales that were conceptually similar into broader measures of underlying attitudes. These broader, underlying attitudes are called *attitude factors*. The results and rationale for this scale-grouping process into factors are discussed in Appendix C of N-3257-FMP. At this point, we want to note that our analysis revealed four major attitude factors and their constituent scales (i.e., the scales that contributed the most to a particular factor):

• Satisfaction with supervision and co-worker interactions (OPM06, OPM07, OPM14, SUPVNUNT)

actions, overall work satisfaction (the meaningfulness of the job), and other major work environment perceptions (trust in management, control of work, reconsideration/redress, training opportunities) improved significantly at Sacramento by the end of year three as compared with the other ALCs, where attitudes worsened during the three-year period.

In addition to their relation to the quality of work life, attitude changes can be addressed in terms of their consistency with the goal of increasing organizational flexibility under PACER SHARE. Numerous attitude changes supported this goal. For example, classification satisfaction, advancement/promotion satisfaction, perceptions of personnel office helpfulness, the perceived link between organizational performance and pay, union-management relations, and information exchange/mission support showed positive change relative to the other ALCs. Most other relevant perceptions showed equal change relative to the comparison ALCs; these included staffing flexibility, supervisory grading criteria, effectiveness of quality programs, consequences of job performance, pay satisfaction, and the connection between job performance and compensation or advancement. The equality of change in pay-related attitudes between Sacramento and the comparison sites is new in year three; it represents an improvement from earlier years, which had reflected worsening attitudes at Sacramento relative to the other ALCs.

- Overall work satisfaction (OPM08, OPM11, OPM12)
- General pay satisfaction (OPM04, OPM19)
- Reward system satisfaction (OPM17, OPM18D, OPM23)

For completeness, we added a fifth group of important, miscellaneous perceptions of the work environment that did not fall clearly onto a single factor (OPM02, OPM15, OPM21B, OPM31B, ORGINVOL).

Chapter Four

ORGANIZATIONAL FLEXIBILITY AND QUALITY OF WORK LIFE: RESULTS FOR PERSONNEL SYSTEM MEASURES

To complement the analyses related to the quality of work life and organizational flexibility in Chapter Three, we turn to personnel system measures to provide answers to questions such as the following:

- Has the skill base of the work force been expanded?
- Are pay opportunities under the demonstration being maintained or improved, particularly for junior-level personnel (while holding the total wage bill constant)? Is pay inversion between supervisors and nonsupervisors being avoided?
- Are crossovers from white-collar to blue-collar positions (and vice-versa) being avoided?
- Is the demonstration bringing about changes in the percentage or distribution of supervisors?
- Is the combination of interventions reducing turnover? Is this more true of some segments of the work force than others? Has the percentage of the career force been maintained?

For the reasons cited earlier (see p. 47), we do not have results for simplicity of job classification or ability to fill vacancies, which were to be drawn from ALC personnel records and OPM's Personnel Office Productivity Analysis.

As in Chapter Three, the primary purpose of the analyses reported here is to establish the predemonstration level for each measure at

Sacramento and the comparison sites, and to compare the rate of change for the Sacramento ALC during the demonstration with that for the other ALCs (taken together) during the same time period. Differential change will be attributed to the demonstration. The discussion will cover both the baseline levels for the measures (levels for calendar year 1987) and any differences between Sacramento and the comparison ALCs taken together. The tables that follow also show results for the three-year change at the comparison sites and Sacramento, and indicate the significance of the difference between the change at Sacramento and the pooled comparison sample (with each observation weighted equally). Results are based on analysis of personnel-record information for all DS employees.

As discussed later, most of the results are based on a series of OLS regression analyses performed on the outcome measures. These include predictor variables to distinguish results for Sacramento baseline (CY 1987), year one, year two, and year three, and the comparison group results for year one, year two, and year three from results for the comparison sites at baseline (the "left out" group).¹ Crossover and turnover results represent raw data. Supporting data and analyses for all results in this chapter are given in Appendix C of MR-310/1-P&R.

VARIABLES AFFECTED BY JOB SERIES CONSOLIDATION

Table 18 presents results concerning multiple skill training through year two of the demonstration; year-three data were not usable because of data file changes. The results correspond to measures I.B.2 and I.C.1 in the evaluation model. (See Tables C.10 and C.11 in MR-310/1-P&R for related information.) Recall that a goal of job series consolidation is to increase the organization's ability to assign workers to positions in which they can handle fluctuations in workload without the encumbrance of narrowly defined job descriptions. This flexibility hinges not only on series consolidation, but on the

¹There are no controls for background variables because, unlike the survey analysis, results are based on information for every member of the work force at each ALC during each time period, and because the evaluation design accounts for differences among the ALCs that existed prior to the demonstration. Moreover, possible work force composition changes that influence the outcomes discussed in this chapter, such as the total labor bill, are relevant to those outcomes.

Table 18
Changes Associated with Job Series Consolidation: Number of Skills
(measures I.B.2 and I.C.1 in evaluation model)

Measure	Regression Coefficient			
	Sacramento Baseline Rate	Sacramento Baseline Diff. from Other ALCs	Year 2 Change for Other ALCs	Year 2 Change for Sacramento
Average number of skills	6.5	-0.2*	0.2*	0.5*

NOTE: An asterisk in column two or three indicates the coefficient is significant at the $p < .05$ level; in column four, it indicates the difference in the coefficients for columns three and four is significant at $p < .05$.

provision of required multiple skill training. Thus, in support of this goal we would anticipate an increase in the average number of skills trained per employee at Sacramento relative to the comparison sites. This expectation leads to the testable hypotheses relevant to the measure in Table 18:

- The average number of skills per employee at Sacramento is the same at baseline as that in the comparison group.
- There was no change in the average number of skills per employee at the comparison sites over the first two years of the demonstration.
- The change in the average number of skills per employee at Sacramento is the same over the first two years of the demonstration as that in the comparison group. (Rejection implies a greater increase in flexibility if Sacramento's change is larger, less flexibility if it is smaller.)

Baseline

Table 18 indicates that the average number of skills coded for Sacramento DS employees—whether DS-related or not—was 6.5 at baseline. This was significantly lower than the average at the other ALCs ($6.5 - .2 = 6.7$). The key question concerns how this pattern

changed *for DS-related skills* during the first two years of PACER SHARE.

Year Two

As seen in column three, skill training increased by .2 skills (one skill per five employees) at the other ALCs by the end of year two. This change was statistically significant, that is, the skill base expanded at the other ALCs. The change at Sacramento was .5 skills—one skill per two employees—as shown in column four. This increase was significantly larger than at the comparison sites. Although the baseline results represent all coded skills, the changes for year two occurred among DS employees and thus represent changes in DS-related skills. The results are consistent with the expansion of the skill base at Sacramento during the first two years, relative to the incidence of multiple skill training at the other ALCs.

VARIABLES AFFECTED BY REVISED BASE PAY DETERMINATION

Salaries

We next examine salaries by pay level and compare supervisor and nonsupervisor salaries. We examined salaries by pay band to observe whether there would be greater salary growth at Sacramento—exclusive of any gainshare payments—than at the other ALCs as a result of this intervention. In general, there are two reasons why such salary growth might occur: (1) pay rates went up or (2) the composition of the workers in a specific pay band group changed, and hence the wages paid within that group changed. We also compare supervisors' versus nonsupervisors' salaries to investigate possible pay inversion that could result from decoupling the respective pay schedules. The "null" hypotheses that apply to this analysis are thus as follows:

- Changes in pay rates at Sacramento are the same as in the comparison group. (Rejection of the hypothesis due to a significant increase implies an unfavorable effect if the total wage bill goes up and, if it does not, a favorable effect.)

- Supervisory and nonsupervisory pay rates have not grown closer at Sacramento than they have in the comparison group (inversion implies an unfavorable effect).

The results are shown in Table 19 and correspond to measures II.A.1 and II.C.1 in the evaluation model. (See Tables C.1 and C.2 in MR-310/1-P&R.) The DH4, DW4, and DX4 levels are not shown because of the very small number of persons they represent. Table 19 shows the baseline pay rates (end of calendar year 1987) at Sacramento (column one), their differences from the baseline rates at the other ALCs (column two), and changes in the rates of pay during the first three years for other ALCs and Sacramento (columns three and four). Wages for blue-collar nonsupervisors are shown in dollars per hour. Salaries for white-collar nonsupervisors and for supervisors are shown in thousands of dollars per year. All figures represent nominal dollars—dollars uncorrected for inflation.

Baseline. Looking first at the blue-collar nonsupervisors, we find that the average hourly wage was higher at Sacramento than at the comparison ALCs for each pay level. The reason is that blue-collar wages are set in part according to prevailing local wages, which are high in Sacramento. The results for the white-collar nonsupervisors and for the supervisors show a different pattern. The average annual salary for the DW3 and DX3 bands did not differ significantly between Sacramento and the comparison sites. For the DW2 band, the average baseline salary was significantly lower at Sacramento, whereas it was higher for the DW1 band. Results for the remaining supervisors also were mixed. The mean DX1 salary was significantly lower at Sacramento than for the comparison group, whereas the DX2 salary was higher. Overall, then, the baseline salaries against which changes under PACER SHARE are judged were higher at Sacramento for blue-collar nonsupervisors, and either higher or lower—depending on the pay band—for white-collar nonsupervisors and for supervisory personnel. White-collar employees at Sacramento in pay bands 1 and 2 earned notably less than their blue-collar counterparts, a disparity that revised base pay determination is intended to reduce as the demonstration proceeds. Finally, the supervisory salaries at Sacramento do not reflect evidence of pre-demonstration pay inversion: they are higher than the mean salaries

Table 19
Changes Associated with Revised Base Pay Determination: Salaries
by Pay Band^a
(measures II.A.1 and II.C.1 in evaluation model)

Pay Band	Equates to	Regression Coefficient				
		Sacramento Baseline Rate	Sacramento Baseline Diff. from Other ALCs	Year 3 Change for Other ALCs	Year 3 Change at Sacramento	
WAGES						
Blue-collar nonsupervisors						
DH1	WG1-3	\$ 9.10/hr	0.89*	1.17*	0.35*	
DH2	WG4-8	11.81	1.60*	1.06*	2.02*	
DH3	WG9-11	13.94	1.66*	1.24*	1.47	
SALARIES						
White-collar nonsupervisors						
DW1	GS1-4	\$15.2/yr	0.4*	2.1*	2.7	
DW2	GS5-8	18.7	-0.3*	3.0*	5.0*	
DW3	GS9-12	27.7	-0.0	4.2*	5.9*	
SUPERVISORS						
DX1	GS5-8	\$22.0/yr	-5.2*	3.4*	7.5	
DX2	GS9-12	33.1	1.2*	4.7*	5.4	
DX3	GS13-14	47.8	2.4	7.7*	8.2	

NOTE: An asterisk in columns two or three indicates the coefficient is significant at the $p < .05$ level; in column four, it indicates the difference in the coefficients for columns three and four is significant at $p < .05$.

^aDH figures represent dollars per hour. DW and DX figures indicate annual salary (in \$ thousands). FWS supervisors were assigned to DX bands by converting their pre-demonstration wages to salary equivalents and placing them where equally paid GS workers were placed.

for the comparable white-collar nonsupervisory levels (i.e., DX1 vs. DW2 and DX2 vs. DW3).

Year Three. Column three shows the wage and salary changes at the other ALCs during the three-year period. As would be expected based on inflation, pay increased for each band. As mentioned above, these changes also could result from changes in work force composition. Changes in composition are determined by (1) the workers who left and (2) those who were hired. Additional analyses—which examined pay changes for employees present over the

entire three-year period and, among those employees, persons remaining in the same pay band throughout—indicate, however, that composition changes do not account for the pay growth; pay grew significantly for employees who worked at DS throughout the three-year period.

Column four indicates the size of pay changes at Sacramento, and the asterisks indicate their statistical significance *relative to the other ALCs* at the end of year three. We see that in about half the cases, the change at Sacramento was significantly different from that in the comparison group. Note, first, that among the blue-collar non-supervisor bands, the increase for DH1 was lower at Sacramento than at the comparison sites, whereas it was higher for DH2, and about the same for DH3. Thus, the pattern was somewhat mixed, although pay did increase for the band containing the most blue-collar nonsupervisors (DH2). For the white-collar nonsupervisor bands, salary increases generally were greater at Sacramento. DW3 and DW2—the largest band—both showed significant increases in average pay relative to changes at the comparison sites. The change for DW1 was similar across ALCs. Finally, for supervisors, salary changes at Sacramento were somewhat larger than at the comparison sites, but not significantly so.

Overall, then, there were mixed results by pay band, but pay tended to increase relative to the other sites because it did so for the bands containing the most Distribution workers. Importantly, as will be discussed later, this occurred without growth in the total wage bill. Also, there is no evidence of pay inversion at Sacramento. For example, the salary increase was similar for the DW2 and DX1 bands, which contain the same pay grades. The same is true of the increases for the DW3 and DX2 pay bands.

The foregoing comparisons are the most meaningful ones when assessing the change in average payout for a given band, which addresses the issue of total labor cost. However, an interesting variation of this analysis deals with the pay changes experienced by persons who have worked in DS at Sacramento throughout the three-year demonstration period relative to those experienced by their counterparts at the other ALCs, in other words, relative to what they might have expected in the absence of PACER SHARE. To examine that issue, we conducted the same type of regression analysis, but

restricted the sample to persons who had been at their respective ALCs for the entire demonstration period. This eliminates the influence of new hires and turnover on the pay results. Included individuals were classified according to their baseline pay band.

The analysis produces results similar to those shown in Table 19, with a couple of noteworthy exceptions. First, the change in wages among *continuing* employees in DH1 was comparable at Sacramento and the other ALCs. This is consistent with Sacramento's explanation of the difference shown in Table 19, which involved the hiring of new employees at salaries near the top of the DH1 band (thus with little room for growth). Second, wages for continuing employees in the DH3 band (at baseline) grew significantly relative to the change experienced by their counterparts at the other ALCs. Thus, the greater pay gains of Sacramento employees become even clearer in the reanalysis. Among continuing employees, the changes for DH2, DH3, DW2, and DW3 all were significantly greater at Sacramento, whereas no bands showed significantly smaller pay changes relative to the other sites. Again, this occurred without growth in the total wage bill.

Crossovers

Table 20 examines blue- to white-collar and white- to blue-collar crossovers (i.e., job changes) among nonsupervisory personnel. This corresponds to measure II.A.2 in the evaluation model. (See Table C.11 in MR-310/1-P&R.) As noted, the comparatively high wages for blue-collar employees at the Sacramento ALC have raised concerns about the possibility of such crossovers. Analyses based on the data in Table 19 suggest that the blue- versus white-collar gap did not close appreciably at Sacramento during the first three years of the demonstration. Formally, our hypothesis is that the change in crossover rates at Sacramento over the demonstration's first three years is no different from the change in the comparison group. Rejection of the hypothesis due to a relative increase at Sacramento implies an unfavorable effect of the demonstration; a decrease would be a favorable outcome.

Baseline. Concerns over crossovers appear to be exaggerated. Crossover rates ranged from near 0 to just over 1 percent. The Sacra-

Table 20

**Changes Associated with Revised Base Pay Determination: Crossovers
(measure II.A.2 in evaluation model, in percent;
nonsupervisors only)**

Type of Crossover	Sacramento Baseline Rate	Sacramento Baseline Diff. from Other ALCs	Year 3 Change for Other ALCs	Year 3 Change at Sacramento
Blue collar to white collar (DH to DW)	0.4	-0.6	-0.1	0.0
White collar to blue collar (DW to DH)	0.3	-0.3	-0.1	-0.1

NOTE: An asterisk in column two or three indicates the coefficient is significant at the $p < .05$ level; in column four, it indicates the difference in the coefficients for columns three and four is significant at $p < .05$.

mento rates did not differ significantly from those of the comparison group for crossovers in either direction. Given the very low crossover rates, this measure will focus on the extent to which the Sacramento rates remain comparable to the others. It is not reasonable to expect a comparative decrease in crossover at Sacramento unless rates rise throughout the rest of the system.

Year Three. During year three of the demonstration, the rates of both types of crossovers remained similar to those at baseline. There was no evidence of change at the comparison sites or of differential change at Sacramento.

VARIABLES AFFECTED BY REVISED SUPERVISORY GRADING CRITERIA

Table 21 presents results concerning the levels of supervision and percentage of supervisory personnel. The results correspond to measures III.C.1 and III.C.2 in the evaluation model, respectively. (See Tables C.3—C.4 in MR-310/1-P&R.) Recall that a goal of the revised supervisory grading criteria is to facilitate a streamlined organizational structure in which supervisors can be assigned to the positions where they are required without regard to the number and grades of subordinates supervised. Because of the decoupling of supervisory positions from the number and grades of subordinates su-

Table 21
Changes Associated with Revised Supervisory Grading Criteria:
Supervisors as Percentage of Work Force, by Level
(measure III.C.1 in evaluation model)

Supervision Level	Regression Coefficient			
	Sacramento Baseline Rate	Sacramento Baseline Diff. from Other ALCs	Year 3 Change for Other ALCs	Year 3 Change at Sacramento
1	7.5	-0.2	-1.2*	-1.8
2	2.3	-0.2	-0.1	-0.2
3	0.6	-0.0	-0.2	0.0
Total, 1, 2, or 3	10.4	-0.4	-1.5*	-2.0

NOTE : An asterisk in columns two or three indicates the coefficient is significant at the $p < .05$ level; in column four, it indicates the difference in the coefficients for columns three and four is significant at $p < .05$.

ervised, we would anticipate possible changes in two areas—in the distribution of supervisors by level of supervision and in increased variation in the percentages of supervisors among the various divisions within DS. The latter is not testable at this time, given the blurring of division boundaries under the merger into DLA. The percentage of all supervisors in the total work force might also change; the direction of the effect is difficult to anticipate, however, since beneficial gains in supervisory percentage in one segment of the organization could be offset by beneficial reductions in other segments. The testable hypothesis relevant to the measures in Table 21 is thus as follows:

- Changes in the distribution of supervisors by supervision level at Sacramento are the same over the first three years of the demonstration as those in the comparison group. (Rejection implies greater flexibility.)

Table 21 indicates little variation in the percentage of supervisory personnel across the ALCs at baseline. The total percentage of supervisors and the percentage of supervisors at each level did not differ significantly at baseline between Sacramento and the comparison group. During the first three years of the demonstration, the percentage of supervisors at level one and, thus, the total percentage of

supervisors declined significantly at the comparison sites. The changes at Sacramento were similar.

VARIABLES AFFECTED BY A COMBINATION OF INTERVENTIONS

Percentage of Career Employees

There are at least three reasons for assessing possible changes in the percentage of career employees during this period. First, the Demonstration On-Call program will provide greater flexibility in the release and recall of workers and in their conversion to career status, depending on workload demands. Work force adjustments will be made in the noncareer Demonstration On-Call complement whenever possible. Thus, a decline in the workload should not necessitate a reduction in the career force to the same extent as at the comparison sites. Second, to the extent that productivity rises, positions vacated through natural attrition may not be refilled. This too would raise the percentage of the career force relative to the other ALCs. Finally, the opposite trend could occur if negative attitudes toward PACER SHARE increased attrition among senior personnel. Results concerning the percentage of career employees at each of the ALCs are presented in Table 22 by pay schedule. The results correspond to measure VI.D.4 in the evaluation model. (See Tables C.7 and C.8 in MR-310/1-P&R.) Formally, we are testing the hypothesis that the percentage of career employees did not change differentially at Sacramento relative to the comparison group.

Baseline. The percentage of career employees ranged from 80 to 85 percent for the nonsupervisory schedules to nearly 100 percent for the supervisory schedule. The percentage of career employees at Sacramento, relative to the comparison ALCs, was significantly lower for the nonsupervisory pay schedules. The percentage of career employees among the supervisors did not differ significantly.

Year Three. As can be seen in the third column of Table 22, at the other ALCs, the percentage of career employees in each pay schedule increased significantly by the end of year three. At Sacramento, the percentage of career employees rose to an even greater extent for the DH and DW pay schedules; the difference between Sacramento

Table 22
Changes Associated with a Combination of Interventions: Percentage of Career Employees by Pay Schedule (measure VI.D.4 in evaluation model)

Pay Schedule	Regression Coefficient			
	Sacramento Baseline Rate	Sacramento Baseline Diff. from Other ALCs	Year 3 Change for Other ALCs	Year 3 Change at Sacramento
Blue-collar nonsupervisors (DH)	77.8	-3.3*	3.9*	14.8*
White-collar nonsupervisors (DW)	81.6	-4.8*	4.5*	16.8*
Supervisors (DX)	97.3	-0.5	2.1*	2.7

NOTE: An asterisk in column two or three indicates the coefficient is significant at the $p < .05$ level; in column four, it indicates the difference in the coefficients for columns three and four is significant at $p < .05$.

and the comparison sites was statistically significant. There was no change in the percentage of career employees among supervisors at Sacramento relative to the comparison sites. On balance, then, the results reflect the fact that senior staff did not disproportionately leave DS at Sacramento as a result of PACER SHARE and that noncareer positions vacated through natural attrition were not filled to the extent they were at the other ALCs. (The former point will become clearer in our discussion of turnover, below.) New hires were substantially lower at Sacramento than at the comparison sites during the demonstration period, according to official personnel records. For both blue- and white-collar nonsupervisors, we thus reject the null hypothesis of no differential change in the percentage of the work force composed of career personnel.

Turnover

The next three tables present turnover information. Instances of turnover are distinguished according to whether they reflect separations or internal transfers (migrations) to other directorates at the given base. The results correspond to measure VI.D.1 in the evaluation model. (See Tables C.12–C.15 in MR-310/1-P&R.) To the extent that PACER SHARE achieves its goal of improving the quality of work

life, we would expect turnover to decrease over time during the demonstration. Such a decrease, however, could be preceded by an initial period of greater turnover, during which time staff members averse to PACER SHARE leave DS. Formally, we are testing the hypothesis that the change in the turnover rate at Sacramento in the first three years of the demonstration is the same as that in the comparison group. Rejection due to a relative decrease at Sacramento implies a beneficial effect; rejection due to an increase implies a harmful effect. The results in the three tables establish the turnover levels for DS as a whole and for specific subgroups of the work force for which changes in turnover are being assessed. Our null hypotheses for the subgroups are analogous to those for DS as a whole. However, we do not associate rejection with a beneficial or negative effect beyond that established for DS because subgroups showing less turnover than DS as a whole must be balanced by subgroups showing greater turnover than DS as a whole. It is not a demonstration objective that any subgroup show an improvement in turnover at the expense of another subgroup. The subgroup-by-subgroup distribution of the overall change within DS is simply a point of information.

Table 23 shows the overall DS separation and migration (internal transfer) rates during baseline (calendar year 1987) and through year three of PACER SHARE. The total turnover figures represent the sum of the separation and migration rates. Separations are defined as all who left their installation during the prior year (1987 for the baseline, April 1990 to May 1991—adjusted to 12 months—for year three).² The denominator in the rate calculation is the total DS work force at Sacramento or in the comparison group at the end of the last month prior to the baseline year or the third year of the demonstration.

Baseline. Overall, the baseline turnover rate was nearly 15 percent at Sacramento. Turnover at Sacramento was significantly higher than for the comparison group. Analysis of the components indicates that separations were nearly 11 percent at Sacramento. The Sacramento rate was significantly higher than the average separation rate across

²Separations include retirements and deaths. We believe there is some merit to including retirements because, like resignations, they represent departure decisions that are at least partly under the control of the employee. Deaths in the work force are likely to be negligible.

Table 23
Changes Associated with a Combination of Interventions: Turnover
(measure VI.D.1 in evaluation model; in percent)

Type of Turnover	Sacramento Baseline Rate	Sacramento Baseline Diff. from Other ALCs	Year 3 Change for Other ALCs	Year 3 Change at Sacramento
Separation	10.8	2.3*	0.3	-1.0
Migration (internal transfer)	<u>3.8</u>	<u>1.0*</u>	<u>-0.9*</u>	<u>-3.2*</u>
Total	14.7	3.3*	-0.6	-4.2*

NOTE: An asterisk in column two or three indicates the coefficient is significant at the $p < .05$ level; in column four, it indicates the difference in the coefficients for columns three and four is significant at $p < .05$.

the other ALCs. Internal transfer (migration) to other directorates at Sacramento was just under 4 percent, which also was significantly higher than for the comparison ALCs.

Year Three. Overall, turnover decreased by 0.6 percentage points at the comparison ALCs during year three of PACER SHARE. The drop in total turnover reflected an offsetting increase in separation (0.3 percentage points) and decrease in migration (-0.9 percentage points). The change in migration was statistically significant. As compared with the other ALCs, internal transfers and total turn-over decreased significantly at Sacramento. Although separations dropped as well, the decrease did not differ significantly from that at the other ALCs.³ As a result, the year-three turnover rates were similar for Sacramento and the comparison ALCs. Because Sacramento had greater turnover at baseline, the change is consistent with a hypothesis of improved quality of work life. To the extent turnover actually becomes lower at Sacramento, the evidence will become even more persuasive.

Table 24 shows the separation and internal transfer rates by career category.

³It could be argued that lower internal-transfer rates are not indicative of improved quality of work life if they result from inability of employees to transfer because of institutional barriers posed by PACER SHARE.

Table 24
Changes Associated with a Combination of Interventions: Turnover
by Career Category
(measure VI.D.1 in evaluation model; percentage of career category)

Type of Turnover and Career Category	Sacramento Baseline Rate	Sacramento Baseline Diff. from Other ALCs	Year 3 Change for Other ALCs	Year 3 Change at Sacramento
SEPARATIONS				
Career	11.4	2.5*	-1.1*	-2.9
Career-conditional	8.0	1.3	8.4*	10.3
INTERNAL TRANSFERS (MIGRATION)				
Career	2.2	0.3	-0.5*	-1.7*
Career-conditional	12.2	3.7*	-3.2*	-10.6*

NOTE: An asterisk in column two or three indicates the coefficient is significant at the $p < .05$ level; in column four, it indicates the difference in the coefficients for columns three and four is significant at $p < .05$.

Baseline. Among career employees, the separation rate at Sacramento (11.4 percent) was significantly greater than at the other ALCs. The separation rate among career-conditional employees⁴ did not differ statistically between Sacramento and the comparison group. The internal transfer (migration) rate to other directorates at Sacramento was not significantly higher than for the comparison ALCs among career employees; however, it was significantly higher among career-conditional employees. When considered together with the separation results, the data indicate that, at baseline, most turnover among more senior (career) employees represented separations, whereas among more junior (conditional) employees it represented transfers.

Year Three. The third-year changes for the comparison group in Table 24 indicate a significant decline in separations by career employees, which was offset by a significant increase among career-conditional employees. Meanwhile, transfers declined significantly for both groups. Transfers remained higher among career-conditional employees.

⁴Career-conditional employees are full-time employees who have not yet met the three-year criterion for career employment privileges; at Sacramento, the category includes DOC employees after baseline (who have a one-year criterion).

tional workers. Unlike baseline, during year three the separation rate was higher among career-conditional employees ($11.4 - 2.5 - 1.1 = 7.8$ for career employees; $8.0 - 1.3 + 8.4 = 15.1$ for career-conditionals).

Migration decreased significantly at Sacramento within the two career categories relative to the comparison group. Separations, however, showed a decline among career employees and an increase among career-conditional employees that were similar in magnitude to those experienced at the other ALCs.

Table 25 shows turnover information by pay schedule.

Baseline. Overall, the results suggest that differences in turnover behavior between Sacramento and the comparison ALCs at baseline tended to occur among white-collar nonsupervisory personnel (who were paid less well relative to blue-collar nonsupervisors than at other ALCs, probably because of the effects of local wage surveys on blue-collar wages). The separation results indicate that such employees at Sacramento had a significantly higher separation rate. Among blue-collar nonsupervisory employees and among supervisors, the rates were statistically equivalent. Sacramento's internal transfer rate also was higher than the comparison group's among white-collar nonsupervisory employees. For the other two pay schedules, transfer differences were not statistically significant.

Year Three. As can be seen in column three, the absence of change in the overall rate of separation at the comparison sites after year three held true for all pay schedules. Migration declined, however, only among white-collar nonsupervisors. Indeed, migration among blue-collar nonsupervisors increased significantly, although the increase was not large enough to offset the decline among their white-collar counterparts. As seen in column four, Sacramento separations showed changes within each pay schedule similar to those occurring elsewhere. The overall relative decline in the internal transfer rate was reflected in significant declines among both blue- and white-collar nonsupervisors. The decline among supervisors was similar across sites.

Table 25
Changes Associated with a Combination of Interventions:
Turnover by Pay Schedule
(measure VI.D.1 in evaluation model; percentage of pay schedule)

Type of Turnover and Pay Schedule	Sacramento Baseline Rate	Sacramento Baseline Diff. from Other ALCs	Year 3 Change for Other ALCs	Year 3 Change at Sacramento
SEPARATIONS				
Blue-collar nonsupervisors (DH)	9.4	0.5	0.7	-0.9
White-collar non-supervisors (DW)	11.2	3.5*	0.3	0.7
Supervisors (DX)	14.6	3.5	-1.5	-7.4
INTERNAL TRANSFERS (MIGRATIONS)				
Blue-collar nonsupervisors (DH)	1.8	0.5	0.7*	-1.1*
White-collar non-supervisors (DW)	6.3	1.7*	-2.6*	-5.8*
Supervisors (DX)	1.4	-0.2	-0.3	-0.4

NOTE: An asterisk in column two or three indicates the coefficient is significant at the $p < .05$ level; in column four, it indicates the difference in the coefficients for columns three and four is significant at $p < .05$.

SUMMARY

We now summarize results from the automated personnel system measures. Our analysis indicates general improvement in outcomes from baseline levels at Sacramento relative to changes at the other ALCs during this time period. Consistent with both increased organizational flexibility (greater salary potential through pay banding and annual increases) and quality of work life (higher pay), average salary growth in DS during the three-year period was greater at Sacramento than at the other ALCs. The change varied by pay band, but wages in the largest bands increased significantly relative to the comparison sites. Among continuing employees, salaries grew at a rate equal to or greater than those for comparable pay bands at the other ALCs. There was no evidence of pay inversion between supervisors and nonsupervisors. These results are noteworthy in showing that most employees fared as well or better financially under job series consolidation and pay banding than did their counterparts at the

other ALCs, which were operating under the traditional system. It also should be noted that the salary growth was offset by a reduction in the size of the work force. Overall labor costs did not increase.

Two other measures of organizational flexibility concerned the number of skills per employee and the percentage of supervisors. Consistent with the goals of expanding training and increasing organizational flexibility, the average number of skills grew significantly more at Sacramento; that is, more skill training appears to have been provided, amounting to about one more skill for every three workers than at the other ALCs. In contrast, the percentage of supervisors declined equivalently across the ALCs. Although this suggests that the flexibility provided by changes in supervisory grading criteria was not used to proliferate supervisory positions, it also suggests that the flexibility has not yet been fully utilized (supervisors within Distribution could have moved).

Finally, two measures of turnover were examined that bear on the quality of work life and hiring practices. It was believed that the percentage of career employees might decrease if senior personnel were unhappy with PACER SHARE. In fact, the results show that the percentage of career employees grew significantly at Sacramento relative to that at the comparison sites during the three-year period. In addition to its consistency with possible improvement in the quality of work life, this outcome reflects fewer hiring actions taken at Sacramento to fill vacated positions. Also consistent with greater quality of work life, the total turnover rate decreased significantly at Sacramento. It thus became similar to that at the other ALCs, rather than maintaining its historically higher rate.

Chapter Five

RESULTS FOR WORK QUALITY MEASURES

We now consider measures of work quality (VI.B.1 in the evaluation model). As we indicated earlier, one of the goals of PACER SHARE was to maintain work quality while increasing productivity and, in the longer term, to improve quality as well. The quality measures evaluated fall into two groups: (1) measures of error rates for particular processes such as packing (Quality Management Division or DSQ measures) or as assessed in reports of discrepancies (RODs) in shipped (or received) items and (2) measures of success in meeting timeliness and support goals (Management Services Division or DSMPA measures). During the evaluation period, collection of data for reports of discrepancies and timeliness/support measures was directed by the Air Force Logistics Command (AFLC) and was performed consistently across the ALCs. Therefore, these measures afford a standard of comparison across the Air Logistics Centers and have been chosen to constitute the measures used in our analysis. This also applied to the DSQ error rate measures during the baseline and first-year periods. During year two, AFLC discontinued the directive to collect these data. As a result, we will restrict our analysis of error rate changes to Sacramento, where some of the measures continue to be collected under the prior procedures.¹ Monthly data observations for the ALCs covering 1985–1987 were combined to form the baseline period, and each month was weighted equally.²

¹Additional measures can be maintained through local initiatives. In this manner, four error measures previously included in our analysis were retained by Sacramento; monthly data collection for other measures was discontinued.

²See R-3753-FMP for discussion of the analysis underlying this procedure.

Each of the quality categories will be discussed in turn. Full annual site-specific results, regression analyses, and statistics for these measures are shown in Appendix D of MR-310/1-P&R.

ERROR RATES AND REPORTS OF DISCREPANCIES

Table 26 presents the results for the DSQ and ROD measures. Measures are distinguished by the area of work they pertain to and the particular error or problem rate they involve.

We begin by looking at results of ordinary least-squares regression analyses performed for the DSQ and ROD measures of (monthly) error rates. The regression model employed was similar to that used in the multiple skill analyses reported in Table 18, except that, as noted, the DSQ measure analyses used year-three data for Sacramento alone (and t-tests were used to assess the significance of the three-year change at Sacramento relative to its baseline; see Appendix D of MR-310/1-P&R). If we read across the first row, we can see that the error rate prior to the demonstration on controlled exceptions (or BL7) was 7.3 percent. In this case, the regression coefficient shown in the next column indicates that the error rate was significantly higher than it was at the other ALCs by 5.2 percentage points; in other words, it was 2.1 percent at the other ALCs. The change at Sacramento during year three is shown in the last column. According to the results, the error rate decreased nonsignificantly by 0.2 percentage points.

If we look at the broad pattern of results, we note that with the exception of the measure just discussed, error rates generally were in the area of 1 percent or less at baseline at Sacramento. As discussed in our earlier reports, the error rates at Sacramento tended to be lower than they were at the other ALCs, that is, there was better quality to begin with. Column four indicates that, overall, year-three error rates at Sacramento tended to be comparable to those at baseline. One measure showed significant improvement (VL1), two showed significant increases (PL4 and VL3), and one showed no change (BL7). In short, then, work quality as assessed by the DSQ measures began at a superior level at Sacramento and the error rate remained about the same there through year three of the demonstration.

Table 26

Results for Measures of Work Quality: Quality Division Indicators
 (measure VI.B.1 in evaluation model; percentage of errors)

Work Area and Measure	Sacramento Baseline Rate	Regression Coefficient		
		Sacramento Baseline Diff. from Other ALCs	Year 3 Change for Other ALCs	Year 3 Change at Sacramento
QUALITY MANAGEMENT (DSQ) MEASURES				
<i>Supply</i>				
BL7: Controlled exceptions	7.3	5.2*		-0.2
<i>Preservation, packaging, and packing</i>				
PL4: Packing process	1.1	-0.4*		0.7*
<i>Inventory</i>				
VL1: Location audit program survey	0.2	-0.2		-0.2*
VL3: Physical count of non-controlled items	0.5	-1.9*		1.2*
<i>RODs</i>				
Received (percentage of issues)	0.2	-0.1*	0.0	0.0
Initiated (percentage of receipts)	0.5	-0.4*	0.1	0.1

NOTE: For DSQ measures, an asterisk indicates the coefficient is statistically significant at $p < .05$. For RODs, an asterisk in column two or three indicates the coefficient is significant at $p < .05$, or, in column four, that the difference between the coefficients in columns three and four is significant at $p < .05$.

The lower portion of the table shows RODs. Reports of discrepancies indicate problems or inconsistencies with shipments from DS (RODs received) or, secondarily, with shipments into DS (RODs initiated). The ROD results show much the same pattern as for the DSQ measures. Error rates were generally 1 percent or less and were lower at Sacramento than at the other ALCs prior to the demonstration. During year three, there was no change at the other ALCs on these measures, and there was no differential change between Sacramento and the other sites.³

TIMELINESS AND SUPPORT

In Table 27 we examine the Management Services Division measures of compliance with receiving timeliness and issue support goals. Receiving documents posted within standard (one day) and receipts binned within standard (two days) are both measures of receiving timeliness, with the optimum performance being 100 percent. The official goals are 90 and 70 percent, respectively. For the third and fourth measures, which pertain to shipping support, the lower the rate, the better.

The first column indicates the mean timeliness/support rate (in percent) during the baseline period for each measure at Sacramento. The baseline period extends from the date of publication of the current standard through December 1987. The period varies somewhat across the measures. The start dates are September 1985 for the first two measures, October 1985 for high-priority requisitions, and January 1985 for the denial rate measure. As before, the statistical significance of the Sacramento baseline rate as compared with the rate for the comparison group and changes during year three were evaluated using ordinary least-squares regression.

³In the case of RODs initiated, it can be argued that a higher rate results from greater scrutiny of receipts by DS, rather than poorer quality of receipts (a situation that one would like to see corrected over time). In this context, it may be noted that the difference in the rate of RODs initiated by Sacramento and the comparison ALCs is largely attributable to the initiation rate at Ogden, which is higher than the others. If we remove the Ogden data, the Sacramento results are comparable with those for the remaining ALCs.

Table 27**Results for Measures of Work Quality: Management Division Indicators
(measure VI.B.1 in evaluation model; percentage of receipts/issues)**

Management Services (DSMPA) Measure	Sacramento Baseline Rate	Regression Coefficient		
		Sacramento Baseline Diff. from Other ALCs	Year 3 Change for Other ALCs	Year 3 Change at Sacramento
Receiving documents posted within one day (goal = 90%)	97.6	4.9*	4.7*	-5.7*
Receipts binned within two days (goal = 70%)	82.7	9.4*	4.4*	-29.0*
High-priority requisitions (ceiling = 30%)	28.7	-2.8	-0.3	7.3*
Denial rate (ceiling = 1%)	1.0	0.2*	-0.3*	0.0*

NOTE: An asterisk in column two or three indicates the coefficient is significant at the $p < .05$ level; in column four, it indicates the difference in the coefficients for columns three and four is significant at $p < .05$.

Overall, predemonstration timeliness indicators generally met applicable standards, and Sacramento ALC timeliness/support tended to be as good as or better than that at the other ALCs. The percentage of receiving documents posted and receipts binned within standard was significantly greater at Sacramento, and the percentage of high-priority requisitions was lower (though not significantly). Denial rate measures the inability to fill a request for an item that was believed to be available. The Sacramento denial rate was significantly higher, although the difference was not large in absolute terms.

As indicated in column three, things generally improved at the other ALCs during the third year. The percentage of documents posted within one day and receipts binned within two days both increased significantly. The percentage of high-priority requisitions and the denial rate both declined, the latter significantly.

The results for Sacramento in column four show a different pattern. Relative to the other ALCs, the year-three changes are all significant and in an undesirable direction. Although the relative differences are statistically significant, two of the changes are not especially trou-

bling. While declining nearly 6 percentage points, receiving document posting still remained above the goal of 90 percent. Similarly, the denial rate actually stayed at the goal of 1 percent at Sacramento, while declining at the other sites. The two more troublesome changes concern, first, the percentage of receipts binned within two days, which showed a large decline relative to the other sites, putting it well below the goal of 70 percent. Second, the percentage of high-priority requisitions increased by about 7 percentage points, putting it above the goal of 30 percent.

Sacramento has offered explanations that may account for the last two changes. They indicated that binning timeliness was adversely affected by the release of DOC workers who were responsible for entering the computer data required for binning. Binning actions were delayed until a sufficient number of trained workers were assigned to the task and the backlog was eliminated. In addition, the installation of the Automated Warehouse System makes it possible to locate items for shipping when they are tracked by module, rather than by bin. Thus, there has been inconsistency between the actual mission requirement (module) and the standard (bin). The inconsistency now has been resolved; future checks will be made by module. If these factors accounted for the degradation, one would expect to see improvement on this indicator in the near term. Similarly, Sacramento reports that the high-priority requisition rate has been driven up by support of the F-15 program, unprogrammed depot maintenance workloads involving repair of Navy communications vans, and a generally greater dependence of Sacramento on depot maintenance workload and priorities.

SUMMARY

Our analysis of work quality focused on command-directed measures of error rates and RODs maintained by the Quality Division and measures of timeliness and support maintained by the Management Division. The error rates for controlled exceptions, packing process, location audit program survey, and physical count of noncontrolled items showed no overall pattern of change from baseline, at which time rates at Sacramento were superior to those at the comparison sites. Similarly, reports of discrepancies showed no overall pattern of change from baseline, remaining lower at Sacramento. Finally, there

was a relative decline in timeliness and support—as assessed by receiving document posting, binning, high-priority requisitions, and denials—relative to the other ALCs. The two largest changes occurred for binning timeliness and requisitions, and apparently are at least partially attributable to AWS implementation, unprogrammed workloads, and management decisions, such as release of DOCs and support of the F-15.

Chapter Six
ANALYSIS OF COST SAVINGS

We seek to learn whether PACER SHARE led Sacramento to achieve cost savings relative to what would have been expected from its pre-PACER SHARE performance, and more tellingly, whether PACER SHARE produced cost savings when judged in comparison with other ALCs' performance. Some turbulence occurs in any field demonstration, and that has been the case with PACER SHARE. All ALCs experienced a workload reduction during 1987. The workload at Oklahoma City and San Antonio more or less rebounded, while the workload at Ogden, Warner-Robins, and Sacramento continued to trend downward through June 1991, the end point of the present analysis. Further, all ALCs coped with a temporary hiring freeze in summer 1988, which was followed by a second, longer freeze from January 1990 onward through mid 1991. Even more disturbing at the local level, the ALCs faced prospects of base closure, partial absorption by the Defense Logistics Agency, and on-base reorganization. Although by the end of the third year it appeared that the ALCs would remain open, plans to shift part of their operations to the Defense Logistics Agency had matured, and a reorganization of the Directorate of Distribution at Sacramento had begun. Despite such pressures, our analysis reveals similarity across ALCs in factors that affect labor cost, both in the baseline period and in the more turbulent demonstration period.

The results of the cost saving analysis through the third year of PACER SHARE continue the pattern seen in year one and year two. The third-year results may be summarized as follows: (1) Sacramento's labor cost for a given level of output trended down more rapidly during the demonstration period—under PACER SHARE—

than during baseline. (2) Nevertheless, Sacramento's labor cost was not statistically lower during the demonstration period than during baseline. (3) Labor cost at the other ALCs was not statistically lower during the demonstration period than during baseline. (4) Sacramento's labor cost did not decline relative to that of the other ALCs' from baseline to the demonstration period. As a result, the cost analysis indicates that while there was some tendency for labor cost to decline more rapidly at Sacramento, on the whole PACER SHARE had produced no labor cost savings during the first three-plus years of its implementation.

These findings should be related to the fact that PACER SHARE steadily paid gainshares in its second and third years. Although PACER SHARE did not pay gainshares during its first year, it did pay them in all but three of ten quarters thereafter, from winter 1989 through spring 1991.¹ For gainshares to be paid, current unit cost must be less than "would have" unit cost, which in PACER SHARE equals baseline average unit cost. Thus, the payment of gainshares offers some evidence of cost savings relative to Sacramento's *baseline* performance. Moreover, we believe the PACER SHARE gainsharing formula actually *underestimated* the size of gainshares that could have been paid, as discussed below. But despite the string of gainshare payments, those cost savings were nevertheless not statistically significant. If Sacramento's January-June 1991 performance were to continue, the likelihood of discerning statistically significant cost saving would increase. Yet as it was, the gainshare-related cost savings lay within the range of values expected from baseline performance. Moreover, the focal point of our PACER SHARE evaluation is Sacramento's performance compared *with the other ALCs*. The other ALCs reflect systemic patterns one might expect of Sacramento in the absence of PACER SHARE. In fact, their cost moved similarly to Sacramento's, so by this comparative yardstick Sacramento again showed no statistically significant cost savings.

This chapter draws extensively on material in the year-two cost savings analysis, and so we begin our discussion in that context. We

¹A productivity cash award was paid in the first quarter of the first year and the third quarter of the third year, but it was not based on the productivity gainsharing formula.

then describe the regression labor cost model, report the data analysis and hypothesis tests, then relate our findings to gainshare determination.²

RELATIONSHIP TO YEAR-TWO COST ANALYSIS

Our analysis parallels the year-two cost analysis but with a year's more data. First, as in year two, we have complete data for all five ALCs, and we use output data from the financial data system. These data are preferred to workload system data because they are auditable and correspond one-to-one with actual issues and receipts. Second, whereas in year one (with more limited data) we had employed a unit labor cost specification of the regression model, we again employ a more flexible functional form that we found to provide a better fit to the data. The unit labor cost specification assumes that unit cost is independent of output level. The new specification relates the natural log of labor cost to an intercept, a time trend, and the natural log of output. With this specification we test hypotheses on whether intercept, time trend, and output effect taken as a set and individually differ between Sacramento and the other ALCs and, for Sacramento and the other ALCs, differ between baseline and demonstration periods. With the more limited unit cost specification, hypothesis testing was confined to asking whether the time trend effects differed. Third, we again have enough data to explore whether the other ALCs are sufficiently similar to share the same cost structure, as had been assumed, or whether our results depend on an ALC's aberrant behavior. We again begin by estimating labor cost regressions separately for each ALC—Oklahoma City, Ogden, San Antonio, and Warner-Robins—finding, as in year two, that Oklahoma's City's behavior is not homogeneous with that of the other ALCs. For this reason we drop Oklahoma City from the subsequent cost analysis. Finally, we test whether unit labor cost depends

²That explanation discusses the current gainsharing formula, which differs from the one initially used. The original model determined baseline productivity through calculations that used earned hours, actual hours, and total costs. After evaluating various systems, however, Sacramento determined that a measurement system based on unit or transaction costs would more accurately reflect actual savings. The quarterly transaction costs for 1985 through 1987, converted to current dollars, were averaged to determine the baseline transaction cost. The change is discussed in the March 30, 1990, *Federal Register*, pp. 12079-12081.

on output level. Although PACER SHARE's gainsharing formula assumes independence, we find dependence (as we did in year two). We discuss the consequences of this disparity for the gainshare computation.

LABOR COST MODEL

We estimate the natural log of labor cost as a function of an intercept, time, and the natural log of output. The *intercept* controls for fixed factors that can affect cost, such as plant, equipment, theaters served, weapons systems supported, work force skill and experience, and work force turnover. These factors are "fixed" in the short term but may change over a longer period. Change could result from factors felt throughout the AFLC system or ALC-specific events such as PACER SHARE. *Time* captures the net influence of changes cumulating during a period of analysis. This includes change in equipment, training, and procedures needed by the ALC to accomplish its materiel receiving, storing, and shipping functions. It also includes changes in the size, skill mix, and seniority of the work force. Movement toward a larger work force, a work force requiring more training, or a more senior paid work force would exert upward pressure on labor cost over time, just as technical change, multiple skill training, and streamlined procedures might exert downward pressure. The coefficient on the time variable indicates the percent change in labor cost per unit of time, in our case, per month. Controlling for the fixed factors and the time trend, the *output* coefficient gives the percentage change in labor cost per percent change in output. A higher workload demands more labor, hence labor cost should rise as output increases. But a 1 percent increase in output likely requires a less-than-1-percent increase in labor cost because (1) staffing may be done to permit some slack, which might be devoted to deferrable maintenance, planning activities, human resource development, or taken in the form of leave without pay, for example; (2) incumbent workers often can work more intensively; and (3) added workers typically receive lower wages.

The intercept, time trend, and output effect are allowed to differ between baseline and demonstration periods, for both Sacramento and comparison ALCs. We estimate not only the parameters for each period but also the intercepts. Therefore, although the labor cost

model has a simple structure, it can detect differences between Sacramento and comparison ALCs within a period, and differences for each between periods. The model's basic structure for an ALC in a period is:

$$\ln c_t = a_0 + a_1 t + a_2 \ln x_t + e_t$$

Here, $\ln c_t$ is the natural log of the labor cost in month t , a_0 is the intercept, t is the time variable measured in months, a_1 is the time trend (i.e., percent change in labor cost per month), $\ln x_t$ is the natural log of the output measured as total issues and receipts in month t , and a_2 is the output effect (i.e., percent change in labor cost per percent increase in output).

HYPOTHESES TO TEST

If PACER SHARE interventions are effective in improving organizational flexibility, so that resources may be reallocated more rapidly and efficiently, and effective in creating incentives to encourage those reallocations, then Sacramento's cost should decline relative to other ALCs. Such a cost decline can result from lower cost at Sacramento relative to its base period cost, or higher cost at other ALCs relative to their base period cost, or of course lower cost both places but a greater cost decline at Sacramento. Interestingly, the pattern of cost changes may affect the success of PACER SHARE. Under the gainsharing formula, gainshares may be paid if Sacramento's unit labor cost declines relative to its baseline unit cost, and gainshares themselves may spur Sacramento to attain further cost reductions. But if unit cost does not decline at Sacramento, gainshares will not be paid and the feedback effect will not operate. There could even be an adverse effect if workers expect gainshares but receive none. Our evaluation methodology nevertheless could show Sacramento's cost declining *relative* to that of the other ALCs.

In evaluating labor cost savings, we are most interested in whether Sacramento's labor cost change from base period to demonstration period was less than the respective change at other ALCs. If so, we infer that Sacramento achieved labor cost savings relative to what would have been expected without PACER SHARE. In addition to the relative change hypothesis, we also test a series of intermediate hy-

potheses. All the hypotheses implicitly compare the cost of producing a given level of output at a given time. This qualification is necessary because cost generally depends on time and output level, that is, $c = c(t, x)$, and unless t and x are given the cost comparisons are ambiguous. For this reason it is not suitable simply to test average costs in the base period versus the demonstration period; these costs are unadjusted for time trend and output level. We use regression analysis to make the adjustments. Finally, for each of the cost hypotheses we also test three associated hypotheses concerning the intercept, time trend, and output effect; they help isolate the sources of any cost differences.

Hypothesis 1: Cost is the same at Sacramento and other ALCs during the base period. We expect this hypothesis to be rejected because of intrinsic differences in the ALCs reflecting different physical layouts and workload mixes (beyond what we can measure with our output data). The workload mix depends on the mission assigned to the ALC such as which theaters and weapons systems the ALC primarily supports.

Hypothesis 2: Cost is the same at other ALCs in the demonstration period as in the base period. By looking at other ALCs we learn what happened within the system and hence what would be expected to happen at Sacramento were PACER SHARE not introduced. Cost at the other ALCs may have declined, remained constant, or risen relative to the base period. Whatever the pattern, it is the backdrop for judging Sacramento.

Hypothesis 3: Cost is the same at Sacramento in the demonstration period as in the base period. If PACER SHARE increases productivity, then cost in the demonstration period should be lower than at baseline and the hypothesis rejected. As mentioned, a cost reduction must occur for the payment of gainshares at Sacramento. Still, this hypothesis is an incomplete test of PACER SHARE's effect on cost because it neglects what is happening at other ALCs.

Hypothesis 4: Cost is the same at Sacramento and other ALCs during the demonstration period. A counterpart to hypothesis 1, this hypothesis could be rejected because of differences in mission and physical layout. Still, it is possible Sacramento's and other ALCs'

costs changed in such a way to make them equivalent during the demonstration.

Hypothesis 5: *Sacramento's cost change from baseline to demonstration period is the same as other ALCs' cost change from baseline to demonstration period.* This hypothesis incorporates information from all previous hypotheses and provides a comparative assessment of Sacramento's performance under PACER SHARE. We might find, for example, Sacramento's cost declined and did so more rapidly than other ALCs'; or we might find Sacramento's cost did not decline but other ALCs' cost rose—either pattern would indicate cost savings under PACER SHARE and the hypothesis would be rejected. If the hypothesis is not rejected, there is no statistically significant evidence of PACER SHARE cost savings.

REGRESSION RESULTS

To implement our approach we needed to determine a suitable way of pooling data on other ALCs for the purpose of comparing Sacramento's cost with theirs. We sought a pooled-data model that reflects "typical" ALC behavior, and we chose to judge typicality by referring to labor cost equations estimated for other ALCs individually. As explained, we began by estimating the regressions by ALC, then considered various alternatives for a pooled-data regression. After some experimentation, we settled on a pooled-data regression specification having an intercept for each included ALC but a single time trend and output effect in each period. We prefer this model because of its better fit to the data and closeness to the individual ALC results. Further, for similar reasons we prefer the pooled-data model that excludes Oklahoma City. We include the labor cost and output data by ALC in Appendix B. Below we give relevant data plots, labor cost regressions by ALC, the multiple-intercept pooled model results versus Sacramento's, and the hypothesis tests.

Figure 1 displays labor cost and output over time by ALC. The figure shows a close correspondence between those variables, suggesting that the labor cost model will perform adequately at the ALC level. Labor cost tracks output equally well in the demonstration and base periods, so the model should be effective in both periods. An

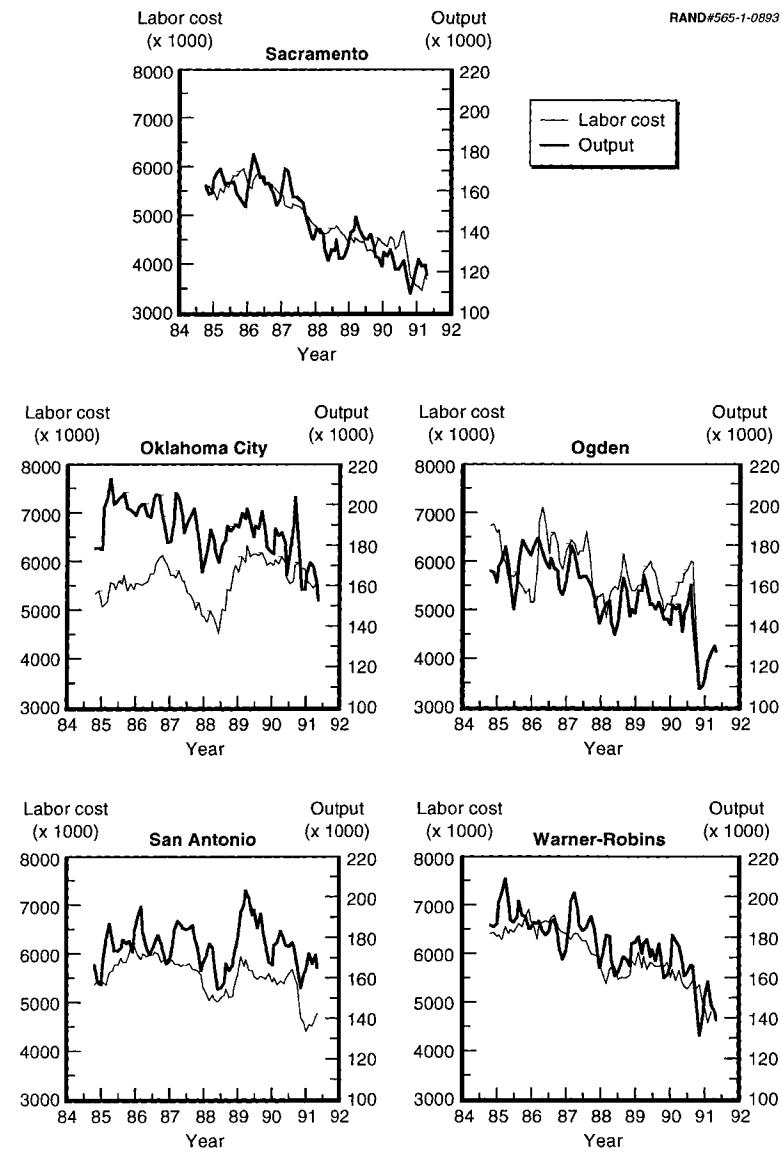


Figure 1—Labor Cost and Output by ALC, Three-Month Moving Average

exception is Oklahoma City, which has a weaker association between output and labor cost during baseline and, more prominently, a rising labor cost relative to output during the demonstration period. Also, as seen, Sacramento's output fell and remained low, while other ALCs' output fell and partially rebounded. These patterns pertain especially to the gainsharing discussion below.

Labor cost regressions for each ALC appear in Table 28. The regression coefficients are similar across the ALCs in the base period. We see (1) similar intercepts with values ranging from 11.57 to 13.55, all within roughly one standard error of each other, (2) seemingly different time trends but all within two standard errors of one another, and (3) output coefficients ranging from .18 to .34, yet again within one standard error of each other. The low output coefficients indicate that labor cost was relatively insensitive to output change.

Table 28
Labor Cost Regressions by ALC
 (dependent variable: \ln labor cost)

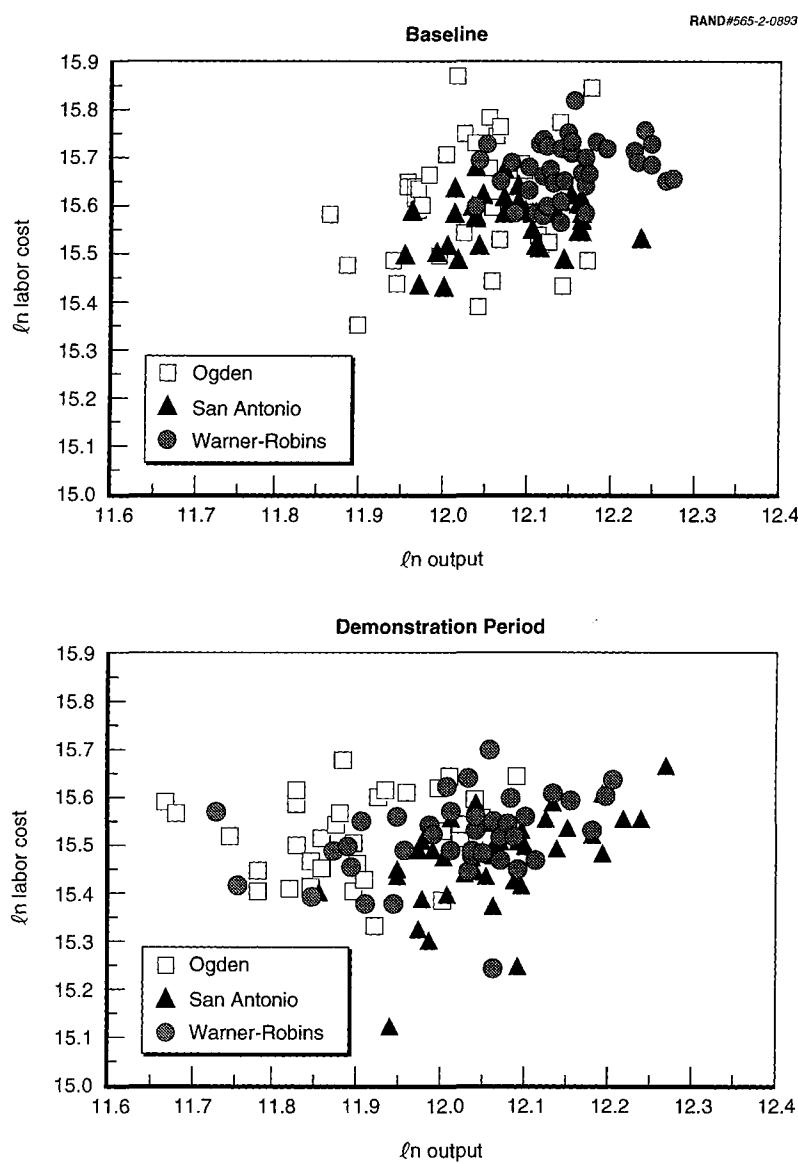
Variable	Sacramento	Oklahoma City	Ogden	San Antonio	Warner-Robins
BASELINE PERIOD					
Intercept	12.91 (2.13)	12.04 (2.00)	11.57 (3.86)	13.43 (2.07)	13.55 (2.32)
Time	-.0023 (.0011)	.0008 (.0010)	-.0009 (.0023)	.0009 (.0010)	-.0011 (.0010)
\ln output	.22 (.18)	.29 (.16)	.34 (.32)	.18 (.17)	.18 (.19)
DEMONSTRATION PERIOD					
Intercept	11.57 (1.74)	6.80 (1.38)	12.73 (2.29)	8.26 (1.53)	13.98 (1.39)
Time	-.0054 (.0011)	.0060 (.0010)	.0017 (.0019)	.0023 (.0009)	-.0029 (.0011)
\ln output	.34 (.14)	.69 (.11)	.23 (.19)	.61 (.13)	.14 (.13)
Adj. R-square	.80	.40	.14	.50	.64
Standard error of estimate	.07	.07	.11	.07	.07

NOTE: Standard errors are in parentheses.

The situation is different in the demonstration period. There is a wider range of intercept, time, and output coefficients across the ALCs. Sacramento, Ogden, and Warner-Robins changed the least, although Sacramento's time trend has more than doubled in size from $-.0023$ to $-.0054$ and its output effect has increased from $.22$ to $.34$. Warner-Robins' main change is in its time trend, which went from $-.0011$ to $-.0029$, whereas the intercept and output effect remained about the same. Ogden's intercept increased, its time trend became positive, and its output effect fell. San Antonio's coefficients show greater change—smaller intercept, negative time trend, and larger output effect—and Oklahoma City's changed the most. Oklahoma City's intercept fell by nearly half (from 12.04 to 6.80), its time trend became strongly positive (from $.0008$ to $.0060$), and its output effect rose sharply (from $.29$ to $.69$). This combination of large changes in its coefficients clearly sets it apart from the other ALCs, as it did in the year-two analysis. For this reason we consider Ogden, San Antonio, and Warner-Robins to be a more suitable comparison group than one which also includes Oklahoma City. The pooled-data regressions and hypothesis tests reported below exclude Oklahoma City.

Motivation for the multiple intercept model over the single intercept model comes from Figure 2, which plots \ln labor cost against \ln output. The separate clusters of points by ALC have similar orientations, providing justification for assuming a common output effect. The clusters do not overlay one another, however, but are shifted left or right, indicating different output ranges. Given the similar cluster shapes but different locations, a model with a common output effect and multiple intercepts seems well suited. Further, judging from Figure 1 (showing labor cost by time) and in view of the regressions by ALC, it is reasonable to specify a common time trend.

In contrast to the multiple intercept model, the single intercept model treats the pooled cluster of points as a unit. As Figure 2 shows, the orientation of the pooled cluster differs from the ALC clusters. The difference is subtle at baseline but pronounced in the demonstration period, where the pooled cluster has an elongated shape and more horizontal orientation. It is therefore not surprising that the single intercept model (not reported) has a high intercept and low output effect in the demonstration period, with values lying outside the individual ALC range.

Figure 2— \ln Labor Cost vs. \ln Output by ALC

The multiple intercept regression, shown in Table 29, appears representative of the other ALCs and consequently affords a good basis for hypothesis tests. The regression fits the data well, displaying fidelity to the individual ALC results given before. Notably, each coefficient lies in the confidence region (plus or minus two standard deviations) of the individual ALC regression parameter estimates.

Comparing the baseline to the demonstration period for the other ALCs, the intercepts decline by roughly .3 to .4 of a unit, the time trend changes from $-.0004$ to $-.0013$ and the output effect rises from .28 to .31. In comparison, Sacramento's coefficients change similarly to those of the other ALCs. Sacramento's intercept decreases from 12.91 to 11.57, time trend becomes a stronger negative effect ($-.0023$ to $-.0054$), and the output effect rises from .22 to .34. Although Sacramento's and other ALCs' coefficients change between the baseline and demonstration periods, the changes fall within two standard errors; in other words these are not large differences from a statistical perspective.

HYPOTHESIS TEST RESULTS

We present hypothesis test results in Table 30. The tests are based on a pooled-data regression rather than on the separate regressions reported in Table 29. Pooling the data provides a common estimated error variance. The pooled regression gives the same coefficients as appear in Table 29, but the standard errors are slightly different because of the common error variance. Given the high degree of similarity in the standard errors in the separate versus pooled models, either approach would produce similar hypothesis test results. As mentioned, we test for equality of labor cost between Sacramento and other ALCs during baseline and during the demonstration period, equality at Sacramento between periods, equality at other ALCs between periods, and equality of cost change at Sacramento relative to that at other ALCs. In addition, we conduct similar tests for intercept, time trend, and output effect estimates. Because we use a multiple intercept model, we also must choose which intercept to use in the tests. In fact, we performed separate sets of tests using each of the intercepts and obtained much the same results. For

Table 29

**Labor Cost Regressions: Sacramento
vs. Comparison Group (dependent
variable: \ln labor cost)**

Variable	Sacramento	Other ALCs
BASELINE PERIOD		
Intercept		
Sacramento	12.91 (2.99)	
Ogden		12.27 (1.59)
San Antonio		12.21 (1.60)
Warner-Robins		12.30 (1.60)
Time	-.0023 (.0015)	-.0004 (.0008)
\ln output	.22 (.25)	.28 (.13)
DEMONSTRATION PERIOD		
Intercept		
Sacramento	11.57 (2.43)	
Ogden		11.95 (.96)
San Antonio		11.85 (.98)
Warner-Robins		11.91 (.97)
Time	-.0054 (.0015)	-.0013 (.0007)
\ln output	.34 (.20)	.31 (.08)
Adj. R-square	.81	.69
Standard error of estimate	.07	.08

NOTE: Standard errors are in parentheses.

present purposes it is therefore enough to present one set of results, which we do using Warner-Robins' intercept.

Tests of cost hypotheses ask whether after controlling for time and output, two costs are statistically equivalent. For example, hypothesis 1 asks whether Sacramento and other ALCs have the same cost at baseline: if $c(SM, B; t, x)$ and $c(Other, B; t, x)$ represent baseline costs, are the two costs equal for a given t and x ? To control for t and x one can use the regression coefficients to predict costs at any given t and x , obtaining estimates of what costs would have been had Sacramento and other ALCs produced the same output at the same time. But making such predictions is unnecessary. Because t and x are the same in these predictions, any difference in predicted costs necessarily comes from the regression coefficients. Thus the test for cost equality reduces to a test of equality between Sacramento's and other ALCs' intercepts, time trends, and output effects, taken as a set. The F-statistic is appropriate for this test, just as for tests of equality between individual coefficients.

Entries in Table 30 state whether the hypothesis of equality is accepted or not, based on the probability of the F statistic in the particular test. For instance, a value of .21 means that the chance of observing a value of the test statistic greater than that computed in the test is 21 percent, assuming the hypothesis is true. In other words, the outcome would be moderately common, so the results are consistent with the hypothesis. The value of .21 is well above usual levels of statistical significance for rejecting a hypothesis, which are usually .10, .05, or .01. On the other hand, if the probability of the test statistic is below the significance level, the hypothesis is rejected.

The results of the hypothesis tests are consistent with the following statements: (1) Sacramento's intercept, time trend, and output effect, when taken individually, are the same as other ALCs' at baseline. However, when the coefficients are viewed as a group, Sacramento differs from other ALCs. This occurs because the sets of coefficients are more precisely measured than are single coefficients. Still, the results suggest that Sacramento and the other ALCs are reasonably comparable at baseline, thereby providing a foundation for the further hypothesis tests. (2) Other ALCs' cost differs between baseline and demonstration periods. The factors driving this difference are changes in the intercept, time trend, and output effects, as previ-

Table 30
Hypothesis Test Results Using Warner-Robins Intercept

H1 hypotheses: Sacramento versus other ALCs during baseline period.				
Equal?	\ln Cost	Intercept	Time Trend	\ln Output
Reject		Accept	Accept	Accept
Probability				
	.0001	.83	.18	.81
H2 hypotheses: Other ALCs, demonstration versus baseline period.				
Equal?	\ln Cost	Intercept	Time Trend	\ln Output
Reject		Accept	Accept	Accept
Probability				
	0.0079	.81	.37	.84
H3 hypotheses: Sacramento, demonstration versus baseline period.				
Equal?	\ln Cost	Intercept	Time Trend	\ln Output
Accept		Accept	Accept	Accept
Probability				
	.18	.67	.08	.65
H4 hypotheses: Sacramento versus other ALCs during demonstration period.				
Equal?	\ln Cost	Intercept	Time Trend	\ln Output
Reject		Accept	Reject	Accept
Probability				
	.0001	.88	.00	.85
H5 hypotheses: Change at Sacramento, demonstration versus baseline period, versus change at other ALCs, demonstration versus baseline period.				
Equal?	\ln Cost	Intercept	Time Trend	\ln Output
Accept		Accept	Accept	Accept
Probability				
	.21	.79	.27	.75

ously described. (3) Sacramento's coefficients also change, but on net not by enough to result in a significant cost difference between baseline and demonstration. With the probability of the F statistic being .18 in this case, in a sense the result is not far from being statistically significant at the .10 level, but it is not significant. (4) Sacramento's cost differs from other ALCs' cost in the demonstration period. The difference in time trend undoubtedly contributes to this result—Sacramento's trend is $-.0054$, other ALCs' $-.0013$. (5) The change in Sacramento's cost from baseline to demonstration period is the same as the change in other ALCs' cost. This is, of course, the most important hypothesis. By implication of statements (3) and (5), *the results indicate no statistically significant PACER SHARE cost savings, judging either from Sacramento's performance under PACER*

SHARE as compared with its previous performance, or, as our approach emphasizes, the change in its performance relative to that in other ALCs. This is the same conclusion reached in the year-two analysis.

Nevertheless, the gainsharing discussion below presents figures based on the regression analysis that reveal a tendency toward cost savings at Sacramento relative to its baseline. Sacramento's cost savings, although not (yet) statistically significant, may therefore be incipient assuming PACER SHARE continues. On the other hand, we find a similar pattern of potential cost savings at other ALCs. Under PACER SHARE Sacramento may be outperforming its past; other ALCs without PACER SHARE may be outperforming their past too.

GAINSHARING

PACER SHARE's gainsharing formula determines the money available for the gainshare pool (g_t)—half of which is returned to the Air Force—as a function of the difference between baseline and current unit cost times current output:

$$g_t = \begin{cases} [(c_0/x_0) - (c_t/x_t)](x_t) & \text{if right-hand side} > 0 \\ 0 & \text{otherwise} \end{cases}$$

The gainshare pool is positive if current unit cost is less than baseline unit cost. If current unit cost exceeds or equals baseline unit cost, the gainshare is zero. The formula thus rewards improved productivity (lower unit cost) with respect to Sacramento's baseline and does not penalize reduced productivity. The formula is easily implemented and draws data from the financial system, the same data system we use.

The formula's simplicity masks a deficiency, however. The formula should conceptually depend on the difference between what would have been the unit cost of current output and what it was, but in practice “would have” unit cost equals a single number, average baseline unit cost. This approach rules out the possible dependence of unit cost on level of output.

Whether unit cost depends on output cannot be readily inferred from tables or plots routinely available to ALC management, namely, data on unit cost by month. Such data, plotted in Figure 3, show little time trend in unit cost except for Oklahoma City in the demonstration period. Even bringing to mind the output plot by month given in Figure 1, the eye cannot determine whether and to what extent unit cost depends on output level. The unit cost plots offer no reason *not* to define a gainsharing formula where "would have" cost is independent of output.

Our model, in contrast, can be used to determine the presence and extent of dependency. The labor cost model is:

$$\ln c_t = a_0 + a_1 t + a_2 \ln x_t + e_t$$

Subtracting $\ln x_t$ from both sides gives an average cost equation:

$$\ln (c_t / x_t) = a_0 + a_1 t + (a_2 - 1) \ln x_t + e_t$$

Here, a 1 percent increase in output x relates to an $(a_2 - 1)$ percent change in unit labor cost, c/x . We can use the estimated coefficient a_2 to test the hypothesis that unit labor cost is independent of output: if $(a_2 - 1)$ differs significantly from zero, independence is rejected.

The intuition behind the importance of adjusting for the dependence of unit cost on output level can be described by differentiating the gainshare equation with respect to output. (Nontechnical readers may want to skip ahead.) We allow "would have" unit labor cost first to depend on output, then assume it does not. In the first case:

$$g_t' = \left[(c_0 / x_0)' - (c_t / x_t)' \right] (x_t) + \left[(c_0 / x_0) - (c_t / x_t) \right]$$

The first term in brackets on the right-hand side is the indirect effect of a change in output as it is felt through "would have" unit cost and

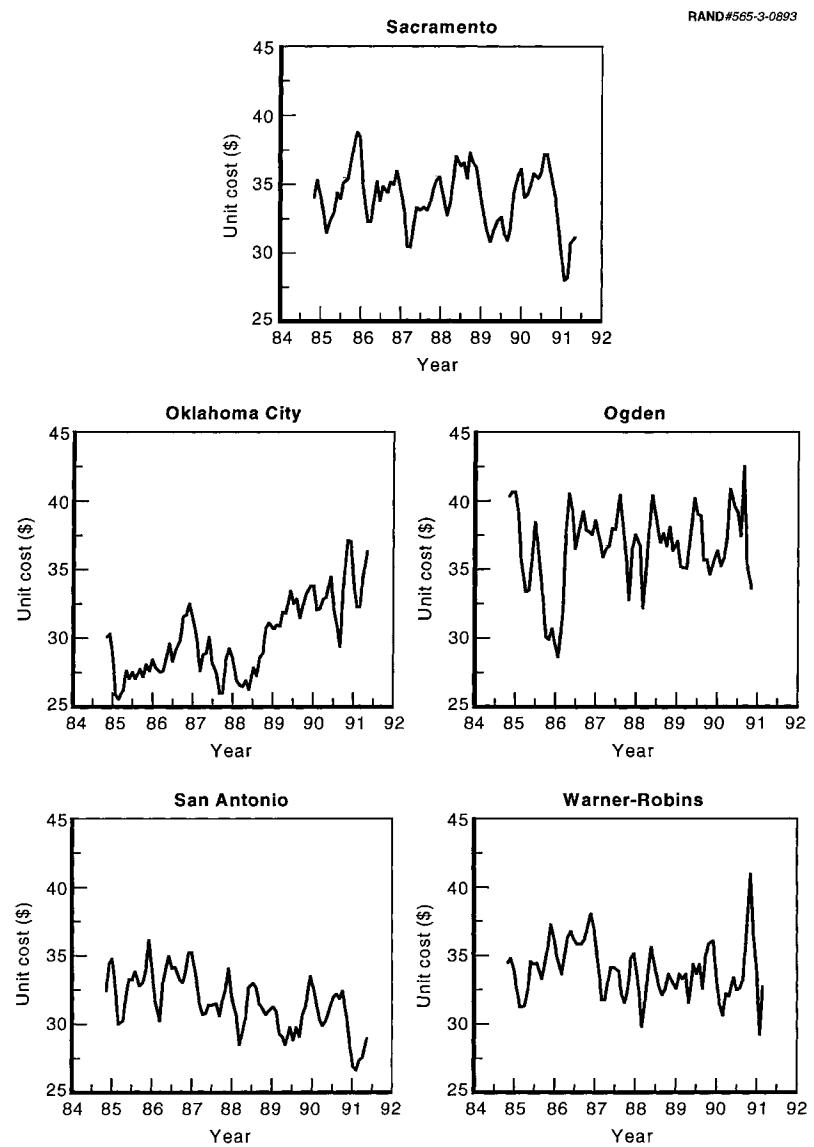


Figure 3—Unit Cost Trend by ALC, Three-Month Moving Average

current unit cost, respectively. If the production structure and efficiency remain the same, these incremental effects on unit costs would be zero and the first term would vanish. The second term is the direct effect of a change in output and equals the difference between "would have" and current unit cost.

In the second case, representative of the PACER SHARE gainshare formula, "would have" unit cost is specified not to vary with output, hence the effect of output on it is constrained to be zero. The above equation becomes:

$$g_t' = \left[-\left(c_t / x_t \right)' \right] (x_t) + \left[(c_0 / x_0) - (c_t / x_t) \right]$$

The difference between the constrained and unconstrained derivatives is the term $-\left(c_0 / x_0 \right)' (x_t)$. Our regression results imply that unit cost falls as output increases, so the unit cost derivative in this term will be negative in reality and the overall term will be positive. Therefore the gainshare as output increases will be *larger* under the PACER SHARE formula than under the more general case where "would have" unit cost is adjusted for change in the level of output. For Sacramento, which experienced a rapid and substantial *decline* in its workload just before PACER SHARE began, it follows that PACER SHARE gainshares were *below* what they would have been had output level remained the same.³

³A rough idea of this decrease may be obtained as follows. From the unit cost equation

$$\begin{aligned} d \log(c/x) / d \log x &= (a_2 - 1) = -.7 \text{ approx.} \\ \text{so} \quad d(c/x) / dx &= -.7 (c/x) / x \end{aligned}$$

We therefore obtain the following valuation:

$$-(c/x)' x = .7 (c/x)$$

Actual unit cost has not changed much at Sacramento from baseline to demonstration period (Figure 3), hence the contribution of $[(c/x)_0 - (c/x)_t]$ to the derivative is very small, whereas the term $.7 (c/x)$ makes a large contribution to the gainshare derivative. This analysis is borne out in Table 32 and Figure 4, showing larger gainshares when "would have" unit cost is adjusted for the decrease in output occurring during the onset of PACER SHARE.

Table 31
Tests for Independence of Unit Cost from Output

Site	$a_2 - 1$	t-value	Reject Independence $(a_2 - 1) = 0?$
BASELINE			
Sacramento	-.78 (.25)	-3.13	yes
Other ALCs	-.72 (.13)	-5.47	yes
DEMONSTRATION			
Sacramento	-.66 (.20)	-3.25	yes
Other ALCs	-.69 (.08)	-8.68	yes

NOTE: All t-values exceed the .01 significance level of 2.4. Estimates of a_2 come from Table 32. Standard errors are in parentheses.

When we test for independence of unit cost from output, the results clearly reject it (Table 31).

Sacramento's regression results imply that a 1 percent increase in output is associated with a .78 percent drop in unit labor cost at baseline and a .66 percent drop during demonstration period. For other ALCs, the response is about .72 percent at baseline and .69 percent during demonstration period, values not much different from Sacramento's. What are the implications for the gainsharing computation?

The dependence of unit cost on output has little importance for gainsharing if workload had remained the same from baseline to the demonstration period. But Sacramento's workload fell by 20 percent (Figure 1), enough to increase unit labor cost by about 14 percent if we use an intermediate .7 estimate for Sacramento's output effect on labor unit cost. *Unit labor cost, in other words, would have been about 14 percent higher because of the output decline alone—without any change in operating efficiency.*

Table 32 shows how the dependence of unit cost on output affects the gainshare computation for Sacramento. The table shows pro-

Table 32
Sacramento Gainshare Pool Adjustment Computation (including Air Force share)

Demonstration Quarter	Output	Cost	Cost/Output	Baseline Unit Cost (\$)				Gainshare Pool (\$)			
				Un-adjusted	Adjusted	Adjusted + se	Adjusted - se	Un-adjusted	Adjusted	Adjusted + se	Adjusted - se
1988											
Winter	420,228	14,192,989	33.77	34.45	36.32	40.08	32.90	285,673	1,067,961	2,650,913	(366,230)
Spring	391,096	13,753,377	35.17	34.45	38.11	42.06	34.53	(278,438)	1,151,602	2,697,631	(249,135)
Summer	389,216	14,159,136	36.38	34.45	38.17	42.13	34.58	(748,971)	698,153	2,239,236	(698,102)
Fall	378,613	13,793,022	36.43	34.45	38.61	42.61	34.98	(748,176)	824,553	2,340,771	(549,174)
1989											
Winter	417,296	13,611,868	32.62	34.45	35.54	39.23	32.20	765,774	1,218,441	2,756,725	(175,278)
Spring	423,673	13,348,426	31.51	34.45	34.87	38.49	31.59	1,248,931	1,425,778	2,958,242	37,331
Summer	406,656	12,726,166	31.29	34.45	35.80	39.51	32.43	1,284,882	1,831,824	3,341,862	463,697
Fall	381,255	12,964,237	34.00	34.45	37.39	41.27	33.88	171,638	1,290,875	2,769,496	(48,789)
1990											
Winter	387,277	13,131,109	33.91	34.45	36.67	40.47	33.22	212,249	1,068,425	2,541,281	(266,016)
Spring	373,820	13,395,454	35.83	34.45	37.34	41.22	33.83	(515,747)	564,452	2,012,453	(747,469)
Summer	364,594	13,310,508	36.51	34.45	37.87	41.80	34.31	(748,677)	497,388	1,929,621	(800,247)
Fall	324,649	11,080,917	34.13	34.45	41.16	45.43	37.30	104,638	2,283,097	3,669,288	1,027,177
1991											
Winter	376,213	10,505,006	27.92	34.45	36.48	40.26	33.05	2,457,150	3,218,519	4,642,001	1,928,813
Spring	353,777	10,967,700	31.00	34.45	37.97	41.91	34.40	1,221,439	2,464,371	3,857,621	1,202,054

NOTE: Values imputed using coefficients:

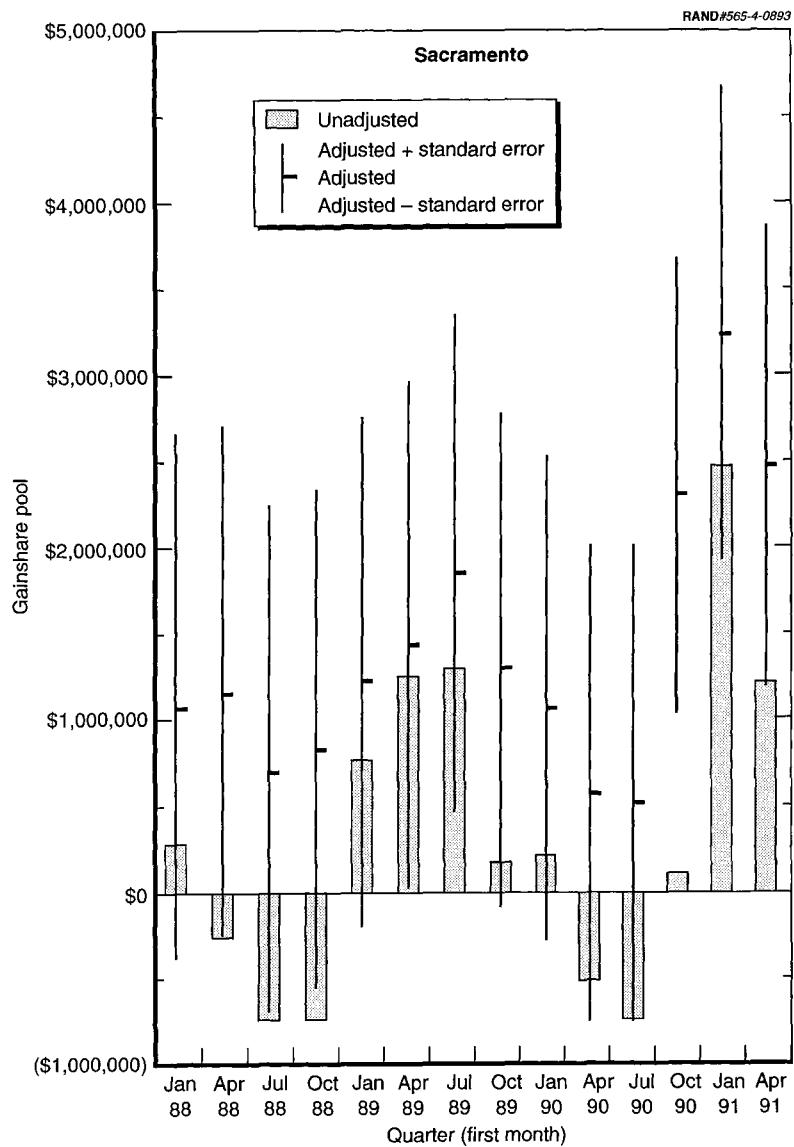
Baseline output .2214

se .0987

duction, cost, and gainshare figures based on setting "would have" unit cost equal to average baseline unit cost and alternatively, equal to adjusted baseline unit cost. (The computations are illustrative based on our estimates, not official gainshare computations.) The first two columns give output and labor cost, and the third column the ratio of labor cost to output, or unit cost. Next come two versions of "would have" unit cost: baseline average unit cost, which is constant because it is averaged over the whole base period, and adjusted baseline unit cost, a quantity predicted from Sacramento's baseline regression and therefore depending on time and output.⁴ These alternative versions enter the gainshare formula to produce unadjusted and adjusted gainshare amounts: gainshare = ("would have" unit cost - current unit cost) \times current output. In addition, we give adjusted "would have" unit costs for a standard error above and below the regression prediction, and also compute gainshares for those values. Negative values are shown in parentheses.

From PACER SHARE's viewpoint, the most important figures in the table are the gainshares. As expected, adjusting for output level makes a major difference in gainshare size. All adjusted gainshares are positive and often substantially larger than the unadjusted gainshares. The adjusted gainshares plus a standard error loom still larger, of course, but the adjusted gainshares minus a standard error are less than the unadjusted gainshares about half the time. We depict the gainshares in Figure 4, which shows the unadjusted, adjusted, and adjusted-plus and -minus one standard error. We conclude that our adjustment produces larger gainshares not only for our best estimate (the regression prediction) but also for a reasonable range around that estimate. Still, at two standard errors below

⁴As in the regressions, cost figures have been adjusted to constant 1989 dollars; see Chapter Two for adjustment factors. Adjusted baseline unit cost is estimated in several steps: monthly log unit cost is predicted from the baseline unit cost regression evaluated at current time and output level; because we assume cost, hence unit cost, to be lognormally distributed, predicted unit cost equals $\exp(\text{predicted log unit cost} + 1/2s^2)$, where s is the standard error of estimate. Predicted monthly unit cost is then averaged on a quarterly basis. Although table entries for unadjusted gainshares are not official, they are close to Sacramento's official values. They differ in that Sacramento made certain, usually minor, adjustments to current average cost before entering it in the gainshare formula. However, in the spring and summer 1990 quarter where we depict a negative gainshare, Sacramento in fact declared a positive gainshare. Sacramento's actual gainshares are given in Appendix C.



**Figure 4—Sacramento's Gainshare Pool (including Air Force share):
Adjusted vs. Unadjusted**

the prediction the adjusted gainshares are less than zero, a fact echoing the finding of no statistically significant cost savings at Sacramento relative to its baseline.

Although the adjusted gainshares exceed the unadjusted gainshares, the question of whether paying higher gainshares would have induced greater productivity remains open. We frankly expect higher gainshares to create stronger feedback, bringing forth more effort, creating higher gainshares, and so forth. But how much stronger remains an empirical question. The effect might be weak if gainshare size bears little relationship to worker effort, which is a possibility to consider given the per capita distribution of gainshares. Generally speaking, without a clear connection between effort and reward workers may have little reason to work harder; if they believed in such a connection when PACER SHARE began, their belief could have weakened through time by not being strongly reinforced.

The fact that gainshares might have been higher at Sacramento should not be misconstrued. We have found no statistically significant cost savings, and our model inherently accounts for the dependence of unit cost on output. There is also the counterfactual aspect: if adjusted gainshares were higher at Sacramento, what would have happened at other ALCs had they been under gainsharing? We address that in Tables 33 through 35 and Figures 5 through 7, which we present chiefly for comparison purposes and discuss only briefly. The tables and figures parallel those for Sacramento. For each other ALC we compute gainshares, unadjusted and adjusted, and depict the results. The separate computations employ the intercepts for Ogden, San Antonio, and Warner-Robins, respectively, and the time trend and output effect from the multiple intercept model. The results for Ogden and Warner-Robins are similar to Sacramento's, as one would expect given our hypothesis tests and the fact that they also had some decline in output (Figure 1). For San Antonio, in contrast, demonstration period output remained nearer baseline level, and the gainshare adjustment makes little difference. *In all cases, the adjusted calculation results in positive gainshares in nearly all quarters.*

Table 33
Ogden Gainshare Pool Adjustment Computation (including Air Force share)

Demonstration Quarter	Output	Cost	Cost/ Output	Baseline Unit Cost (\$)				Gainshare Pool (\$)			
				Un-adjusted	Adjusted	Adjusted + se	Adjusted - se	Un-adjusted	Adjusted	Adjusted + se	Adjusted - se
1988											
Winter	439,887	15,967,561	36.30	36.20	41.04	45.30	37.18	(43,652)	2,085,918	3,958,528	389,293
Spring	423,938	16,104,547	37.99	36.20	42.03	46.39	38.08	(757,991)	1,714,768	3,563,088	40,148
Summer	471,702	17,364,389	36.81	36.20	39.20	43.26	35.52	(288,776)	1,125,841	3,043,752	(611,830)
Fall	433,017	16,513,451	38.14	36.20	41.25	45.53	37.38	(838,235)	1,350,320	3,203,252	(328,477)
1989											
Winter	471,141	16,480,408	34.98	36.20	38.91	42.94	35.25	574,897	1,850,603	3,751,999	127,895
Spring	476,193	17,668,466	37.10	36.20	38.41	42.40	34.80	(430,280)	622,665	2,519,925	(1,096,295)
Summer	444,463	17,163,627	38.62	36.20	40.47	44.67	36.67	(1,074,066)	823,998	2,689,777	(866,439)
Fall	429,269	14,818,069	34.52	36.20	41.31	45.60	37.43	721,469	2,916,124	4,755,615	1,249,504
1990											
Winter	450,323	15,820,107	35.13	36.20	39.96	44.10	36.20	481,586	2,173,980	4,040,429	482,936
Spring	410,058	16,713,784	40.76	36.20	42.64	47.06	38.63	(1,869,684)	771,507	2,585,181	(871,722)
Summer	460,746	17,911,528	38.88	36.20	39.27	43.34	35.58	(1,232,540)	179,713	2,056,240	(1,520,461)
Fall	324,957	11,031,143	33.95	36.20	50.34	55.56	45.61	732,301	5,326,092	7,022,757	3,788,875

NOTE: Values imputed using coefficients:

Baseline output .2786
 se .0987

Table 34
San Antonio Gainshare Pool Adjustment Computation (including Air Force share)

Demonstration Quarter	Output	Cost	Cost/ Output	Baseline Unit Cost (\$)				Gainshare Pool (\$)			
				Un-adjusted	Adjusted	Adjusted + se	Adjusted - se	Un-adjusted	Adjusted	Adjusted + se	Adjusted - se
1988											
Winter	510,972	15,510,865	30.36	32.77	33.46	36.93	30.32	1,233,688	1,588,150	3,361,757	(18,777)
Spring	499,619	15,141,792	30.31	32.77	33.98	37.51	30.79	1,230,722	1,837,694	3,598,903	242,000
Summer	473,886	15,406,592	32.51	32.77	35.34	39.01	32.02	122,652	1,340,489	3,077,591	(233,365)
Fall	499,586	15,310,902	30.65	32.77	33.86	37.37	30.68	1,060,531	1,605,052	3,359,670	15,328
1989											
Winter	577,504	17,782,424	30.79	32.77	30.55	33.72	27.68	1,142,382	(138,544)	1,691,579	(1,796,677)
Spring	597,098	16,953,207	28.39	32.77	29.68	32.76	26.89	2,613,694	770,731	2,609,158	(894,925)
Summer	553,627	16,373,458	29.57	32.77	31.44	34.70	28.49	1,768,899	1,033,157	2,838,670	(602,678)
Fall	528,813	16,414,612	31.04	32.77	32.45	35.81	29.40	914,590	743,108	2,522,805	(869,336)
1990											
Winter	528,106	16,530,758	31.30	32.77	32.37	35.73	29.33	775,276	564,132	2,337,311	(1,042,408)
Spring	537,985	16,177,225	30.07	32.77	31.86	35.17	28.87	1,452,543	964,949	2,743,033	(646,034)
Summer	519,635	16,862,006	32.45	32.77	32.66	36.05	29.59	166,417	108,606	1,868,895	(1,486,254)
Fall	464,910	14,034,904	30.19	32.77	35.30	38.97	31.99	1,200,196	2,377,955	4,080,390	835,511
1991											
Winter	515726	13,619,889	26.41	32.77	32.78	36.18	29.70	3,280,452	3,287,128	5,040,820	1,698,244
Spring	495082	14,284,387	28.85	32.77	33.67	37.16	30.50	1,939,450	2,384,263	4,113,230	817,780

NOTE: Values imputed using coefficients:

Baseline output .2786

se .0987

Table 35
Warner-Robins Gainshare Pool Adjustment Computation (including Air Force share)

Demonstration Quarter	Output	Cost	Cost/ Output	Baseline Unit Cost (\$)				Gainshare Pool (\$)			
				Un- adjusted	Adjusted	Adjusted + se	Adjusted - se	Un- adjusted	Adjusted	Adjusted + se	Adjusted - se
1988											
	Winter	515,579	16,647,143	32.29	34.43	36.53	40.32	33.10	1,104,242	2,188,193	4,141,901
	Spring	507,557	17,083,349	33.66	34.43	36.75	40.56	33.30	391,839	1,570,574	3,505,465
	Summer	503,974	16,459,049	32.66	34.43	36.91	40.73	33.44	892,776	2,140,392	4,069,632
	Fall	496,459	16,689,698	33.62	34.43	37.20	41.05	33.70	403,385	1,776,426	3,691,838
1989											
	Winter	540,548	18,097,758	33.48	34.43	35.05	38.68	31.75	513,310	847,316	2,812,406
	Spring	537,609	16,992,559	31.61	34.43	35.05	38.68	31.75	1,517,319	1,849,043	3,803,401
	Summer	505,331	17,173,374	33.98	34.43	36.93	40.76	33.46	225,172	1,488,541	3,424,261
	Fall	480,985	17,183,792	35.73	34.43	37.99	41.93	34.42	(623,479)	1,089,331	2,984,723
1990											
	Winter	542,574	17,025,159	31.38	34.43	34.70	38.30	31.44	1,655,664	1,801,385	3,754,181
	Spring	503,665	16,122,136	32.01	34.43	36.54	40.33	33.11	1,219,050	2,283,495	4,192,632
	Summer	481,837	16,084,591	33.38	34.43	37.84	41.76	34.28	505,039	2,146,425	4,037,450
	Fall	393,059	16,062,354	40.86	34.43	43.69	48.22	39.59	(2,529,332)	1,111,516	2,892,887
1991											
	Winter	473,726	13,713,253	28.95	34.43	38.16	42.12	34.57	2,597,134	4,364,541	6,239,673
											2,665,631

NOTE: Values imputed using coefficients:

Baseline output .2786

se .0987

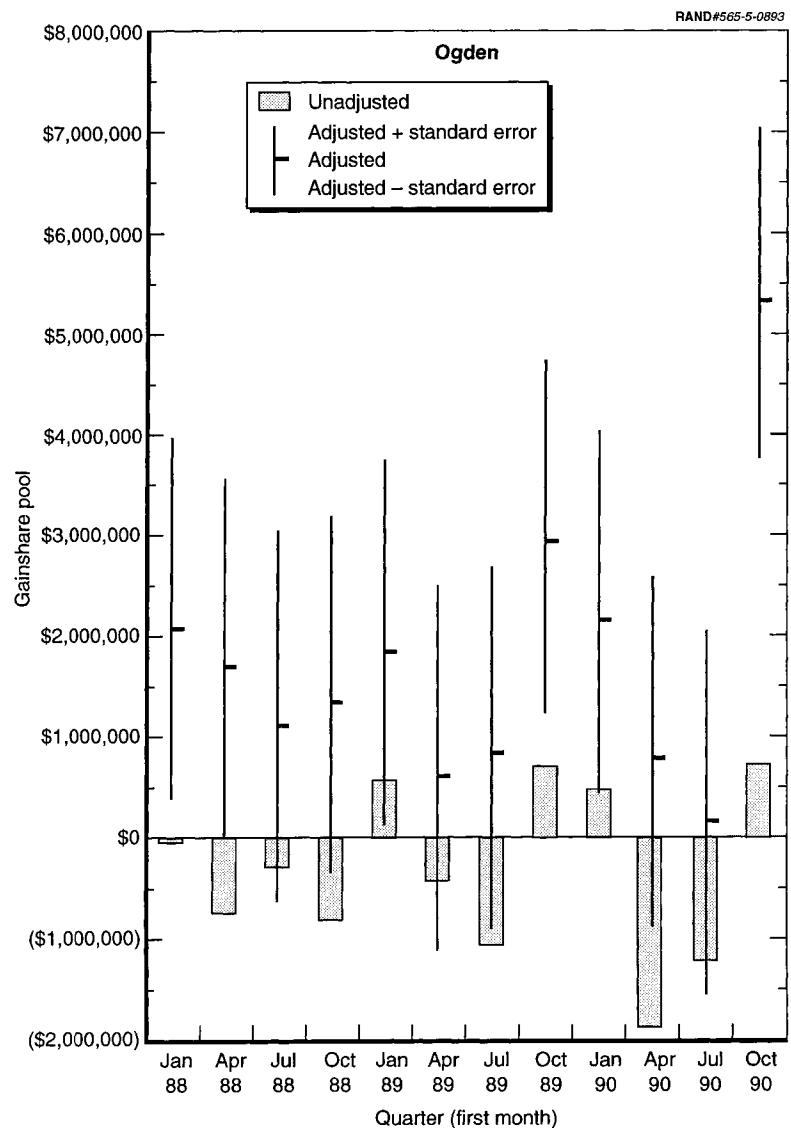
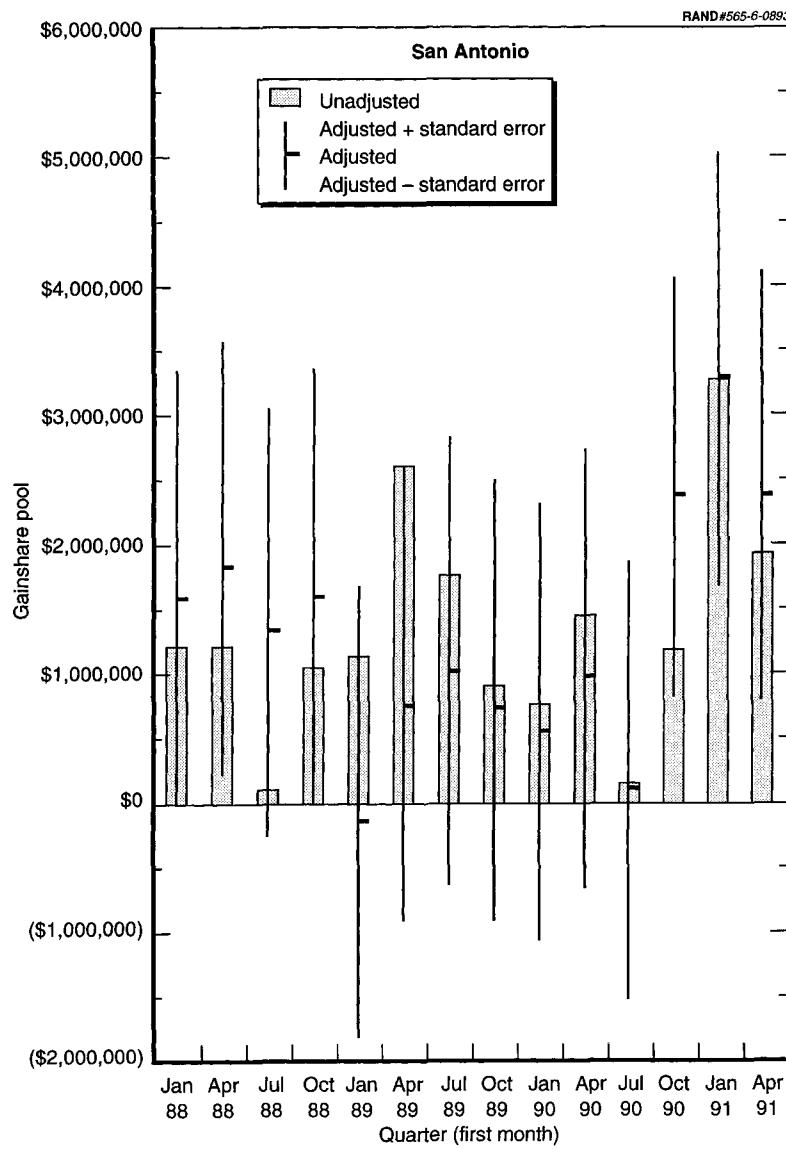


Figure 5—Ogden's Gainshare Pool (including Air Force share):
Adjusted vs. Unadjusted



**Figure 6—San Antonio's Gainshare Pool (including Air Force share):
Adjusted vs. Unadjusted**

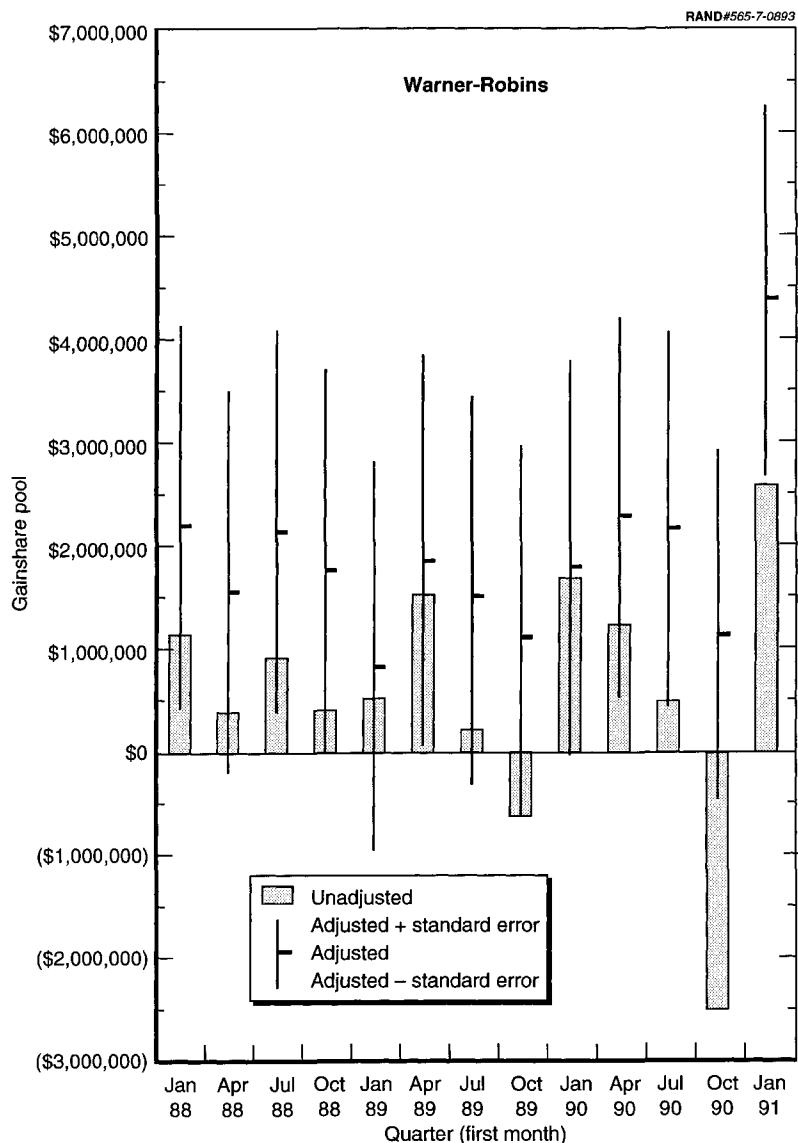


Figure 7—Warner-Robins' Gainshare Pool (including Air Force share):
Adjusted vs. Unadjusted

SUMMARY

We have studied whether Sacramento achieved labor cost savings under PACER SHARE by June 1991, nearly 42 months into the demonstration.

Using the regression results, we performed a series of hypothesis tests involving Sacramento and other ALCs at baseline and during the demonstration period. We found that, despite a more negative time trend during demonstration period, on net Sacramento's labor cost under PACER SHARE was not statistically different from that at baseline. This meant there was no statistically significant cost savings at Sacramento relative to its baseline. We also found that Sacramento's cost experience did not differ statistically from that of other ALCs. Although we found no statistically significant cost savings, Sacramento paid gainshares regularly. These gainshares fell within the range expected from its pre-PACER SHARE cost behavior. The same point holds when the gainshares are adjusted for change in output level, an adjustment working in favor of finding cost savings. We therefore conclude, as in year two, that Sacramento displays a tendency toward cost savings under PACER SHARE relative to its baseline, but more, similar evidence must accumulate before the tendency can attain statistical significance. At the same time, a parallel tendency characterizes the other ALCs. It remains an open question whether Sacramento will succeed in attaining comparative cost savings under PACER SHARE.

Chapter Seven
CONCLUSIONS

The goals of the PACER SHARE Productivity and Personnel Management Demonstration are as follows:

- Increase organizational productivity by improving incentives and training that will help employees work more effectively and encourage them to originate ideas on improving efficiency.
- Increase organizational flexibility in making job assignments and dealing with fluctuations in workload.
- Enrich the quality of work life by creating a work environment in which individual and organizational goals are compatible, opportunities for individuals to work on a variety of jobs are realized, and training opportunities are expanded.
- Preserve or improve the quality and timeliness of work through quality circles, team building, and statistical process control.

Are these goals being achieved? In this chapter, we briefly review the findings of our evaluation of the third year of the demonstration.

PRODUCTIVITY

Our analysis reveals no statistically significant cost savings when Sacramento's experience during the demonstration period is compared with its baseline experience, or when Sacramento's overall experience is compared with other ALCs'. Although finding no significant cost savings, we discovered that PACER SHARE's gainsharing formula underestimated what baseline unit cost would have been in

view of Sacramento's lower workload during the demonstration period, and hence has underestimated cost savings for gainshare computation. Had an adjustment been made, larger gainshares would have been available to strengthen the feedback effect of those payments on productivity. Our approach could contribute toward modifying the gainshare formula to adjust for changes in output level. In any event, the actual payment of gainshares plus the possibility such payments could have been higher sustain the *prospect* of statistically significant cost savings relative to Sacramento's baseline. However, other ALCs also have a tendency for cost savings relative to their baseline, and it remains to be seen whether Sacramento can attain cost savings compared with them, particularly in the context of declining workload (requiring a smaller staff).

ORGANIZATIONAL FLEXIBILITY

The demonstration's success at promoting organizational flexibility and quality of work life was measured through an employee attitude survey and personnel system data. Although we separate the survey and personnel system measures here according to which goal they seem most clearly associated with, it should be kept in mind that organizational flexibility and quality of work life are related. For example, increases in earning potential brought about through pay banding (organizational flexibility) can improve the perceived quality of work life. For that matter, generally speaking the four goals are interrelated, so many of our measures have implications for more than one goal.

Measures related to organizational flexibility generally exhibited encouraging results, although the pattern was not universal. Our emphasis is on the change at Sacramento during the first three years of the demonstration *relative* to the change in DS at the four other ALCs combined. As intended, the incidence of multiple skill training increased at Sacramento relative to the comparison sites. Also as intended, earnings increased for nonsupervisory employees without an increase in the overall wage bill. At the same time, there was no evidence of pay inversion between supervisory and nonsupervisory positions. Crossovers from white- to blue-collar and blue- to white-collar positions did not increase, and remained infrequent. Moreover, the percentage of career employees increased at Sacra-

mento relative to the comparison sites, as the total work force was decreasing in size. Supervisors' classification satisfaction and perceptions of support from the personnel office improved, as, on balance, did work force perceptions concerning advancement/training opportunities, information exchange, union-management relations, and gainsharing of organizational cost savings. On the negative side, the percentage of supervisors within DS showed the same change (decline) as at the other ALCs. Although this indicates that supervisory positions were not proliferated, it also suggests that the flexibility sought through changes in supervisory grading criteria had not yet been fully realized. Also, support for (permanently) eliminating annual performance appraisals increased more at the comparison sites than at Sacramento, where they were temporarily eliminated as part of the demonstration. Other attitudes bearing on organizational flexibility changed similarly across sites. These included attitudes toward staffing flexibility, pay satisfaction and equity, reward system satisfaction, supervisor grading criteria, the effectiveness of quality programs, and the consequences of job performance.

Overall, there is considerable evidence of greater organizational flexibility under PACER SHARE, as reflected in both the attitude changes and personnel measure effects described above. At the same time, the pattern is not yet fully persuasive. Changes in other attitudes and personnel measures remain to be demonstrated, and there are competing explanations for some of the observed changes, such as the increased seniority of the Sacramento work force. That finding, for example, may be attributable to fewer hiring actions being taken at Sacramento in response to reduced workload, rather than improved worker efficiency and personnel release procedures.

QUALITY OF WORK LIFE

There is strong evidence of improved quality of work life at Sacramento. Every relevant attitude area shows significant positive change relative to the other ALCs. These changes include relative gains in job satisfaction, trust of management and co-workers, organizational commitment, perceived influence over events within Distribution, satisfaction with supervision, emphasis and payoff of

team-building activities and group functioning/teamwork, plus a decline in intent to leave DS.

Finally, to the extent that PACER SHARE achieves its goal of improving the quality of work life, we would expect turnover to decrease. At baseline, total turnover was nearly 15 percent at Sacramento—significantly higher than for the comparison group—representing separations of nearly 11 percent and internal transfers (migration) to other directorates of just under 4 percent, both significantly higher than for the comparison ALCs. During year three of PACER SHARE, as compared with the other ALCs, Sacramento showed declines in turnover. Separations decreased comparably at Sacramento and the other ALCs, whereas the decline in internal transfers and total turnover was significantly greater at Sacramento. As a result, the year-three turnover rates were similar for Sacramento and the comparison ALCs. Since Sacramento had greater turnover at baseline (and previously), the change is consistent with an improvement in quality of work life.

WORK QUALITY AND TIMELINESS

Work quality began at a superior level at Sacramento, and for error rates it showed little change throughout year three of the demonstration. Of six error rate measures, one showed improvement at Sacramento during the third year of PACER SHARE, three showed no change, and two worsened. In contrast, measures concerning receiving timeliness and shipping support deteriorated at Sacramento relative to the comparison group. This may be at least partially attributable to the implementation of the Automated Warehouse System, unprogrammed workloads, and management decisions concerning the release of DOCs and support for the F-15 program.

A number of attitude questions relevant to the foregoing discussion were added to the survey at year one. As noted, the year-three results show significant increases in perceived information exchange in accomplishing work and emphasis on team-building concepts in day-to-day operations. Many of the changes—especially those for team building—were large and highly significant. The changes are consistent both with better work quality and improved quality of work life.

A FINAL NOTE

Although the changes in federal civil service practices required to implement PACER SHARE were in place at its outset, it must be recognized that true implementation must unfold over time. For example, DS employees will have to be provided training to take advantage of increased personnel system flexibility in meeting changing workloads, DOC hires and releases will have to occur over time as the need arises, and so forth. As a result, it is important to observe the longer-term results of PACER SHARE before drawing firm conclusions concerning its effectiveness. The year-three results, though not providing evidence of significant cost savings, offer encouragement that PACER SHARE may be beginning to achieve its desired objectives in other areas.

The promise of achieving these objectives and the pattern of change over the life of the demonstration are reflected clearly in the survey data. As noted, individual survey questions were grouped into broadly based scales, which in turn were classified into several broad dimensions (through factor analytic methods). The dimensions and scales are reviewed in Table 36.

Table 37 shows the mean ratings at Sacramento at baseline for these attitude scales and indicates how they differed from the average ratings at the other ALCs. The three rightmost columns indicate

Table 36
Major Survey Areas

SATISFACTION WITH SUPERVISION AND CO-WORKER INTERACTIONS
General supervision and direction, group functioning, open group process, satisfaction with supervision and work unit
OVERALL WORK SATISFACTION
Intrinsic work satisfaction, job satisfaction, intent to turn over
MISCELLANEOUS WORK ENVIRONMENT PERCEPTIONS
Organizational climate, control over work, reconsideration and redress, training opportunities, organizational involvement
GENERAL PAY SATISFACTION
External equity, pay satisfaction
REWARD SYSTEM SATISFACTION
Pay as a motivator, pay-performance link, promotion satisfaction

Table 37
Sacramento Attitude Change by Year

Attitude		Sacramento Baseline		Change Relative to Other ALCs			
		Mean Rating	Difference from Other ALCs	Year 1	Year 2	Year 3	
NONFINANCIAL							
Satisfaction with supervision and co-worker interactions							
OPM06	General supervision/direction	2.96	-.30*	.04	.19*	.21*	
OPM07	Group functioning	2.98	-.20*	.00	.15*	.26*	
OPM14	Open group process	2.61	-.17*	.09*	.24*	.38*	
SUPVNUNT	Satisfaction with supervision/work unit	2.83	-.25*	.02	.21*	.23	
Overall work satisfaction							
OPM11	Intrinsic work satisfaction	3.02	-.33*	.00	.19*	.23*	
OPM12	Job satisfaction	3.32	-.26*	-.03	.07	.20*	
OPM08	Intent to turn over	3.00	.26*	.09	-.03	-.13*	
Miscellaneous work environment perceptions							
OPM15	Organizational climate	2.31	-.32*	-.01	.05	.20*	
OPM02	Control over work	3.02	-.27*	.01	.16*	.19*	
OPM21B	Reconsideration/redress	2.76	-.19	.04	.07	.16*	
OPM31B	Training opportunities	2.59	-.40*	.09	.23*	.30*	
ORGINVOL	Organizational involvement	3.69	-.11*	-.03	.08*	.01	
FINANCIAL							
General pay satisfaction							
OPM04	External equity	2.62	-.32*	-.17*	-.15*	-.04	
OPM19	Pay satisfaction	2.52	-.22*	-.15*	-.13*	.08	
Reward system satisfaction							
OPM17	Pay as a motivator	2.41	.09*	-.30*	-.23*	-.16*	
OPM18D	Pay-performance link	2.27	-.19*	-.17*	-.14*	-.03	
OPM23	Promotion satisfaction	2.18	-.19*	-.21*	-.19*	.03	

NOTE: An asterisk indicates the result is statistically significant at $p < .05$.

the *difference* in attitude change between Sacramento and the other sites during each year of the demonstration. The attitudes are separated according to whether they deal with financial or non-financial areas.

Several patterns are readily apparent. At baseline, nonfinancial attitudes at Sacramento generally were neutral (3.0) or slightly unfavorable, whereas financial attitudes were very unfavorable. In all cases but one (pay as a motivator), attitudes were less favorable at Sacramento. As discussed, this appears to be the result of sensitization to shortcomings in the federal civil service system, which were explained to the work force during the transition to PACER SHARE. It is impossible to know whether or not the information changed perceptions permanently; thus, in the absence of PACER SHARE, one should not necessarily expect Sacramento attitudes to approach those at the other ALCs over time.

The last three columns show that the first year of the demonstration was marked by little change in nonfinancial attitudes, but that financial attitudes worsened significantly relative to the other ALCs. We have argued earlier that this appears to have reflected concerns about pay banding and advancement. We also noted that the personnel system data indicate Sacramento workers fared as well or better under PACER SHARE as did their counterparts at other ALCs. By year two, many of the nonfinancial areas had begun to improve significantly. Attitudes concerning finances, however, still showed serious deterioration relative to the other ALCs. Finally, this changed during year three. Then, financially related attitudes generally reflected changes similar to those occurring elsewhere. Moreover, nonfinancial attitudes continued to improve. By the conclusion of year three, 11 of 12 scales showed significant gains relative to the other ALCs.

The attitudes of the work force at Sacramento toward PACER SHARE itself reflect a similar, developing story. Table 38 shows responses over time for three questions concerning the demonstration: the adequacy of information received about it, understanding of the ways it affects employees and their work, and favorability toward PACER SHARE.

Table 38
Survey Results for Attitudes Toward PACER SHARE

		Baseline Mean Rating	Change		
			Year 1	Year 2	Year 3
V173	Adequately informed about PACER SHARE	2.66	.03	.37*	.52*
V174	Understand how PACER SHARE will affect me	2.67	.18*	.53*	.62*
V175	In favor of PACER SHARE demonstration	2.79	-.34*	-.01	.15*

*Statistically significant at $p < .05$.

Column one shows the ratings at baseline, just prior to the demonstration. There was some dissatisfaction in each of the three areas; the ratings all were below 3.0. As seen in column two, there were mixed results during the first year of the demonstration. Even after a year, there was little change in the perceived adequacy of information received about PACER SHARE. Nonetheless, workers expressed significantly greater understanding of its effects, perhaps by virtue of living through it for a year. With the perceived increase in understanding of PACER SHARE, however, came a large downturn in favorability. The two last columns indicate that, *since the end of year one*, there has been a large, steady gain on each of the three dimensions.

Thus, as true of other undertakings of large magnitude, it appears the impact of PACER SHARE will continue to unfold over the longer term. At this point, some effects seem convincing, while others have begun to appear only recently. Still other areas show no discernible impact to date. Although more data collection over a longer period of operation is required, preserving the integrity of PACER SHARE and collecting useful information over this longer term will be very challenging given declining workload and the partial merger of Distribution into the Defense Logistics Agency.

Appendix A

PACER SHARE VS. OTHER OPM DEMONSTRATION PROJECTS

PACER SHARE is one of several demonstration projects being conducted under the authority of Title VI of the Civil Service Reform Act. These projects test innovations in public personnel management by permitting waivers of current laws and regulations, such as those designed to improve productivity and employee performance by making the federal personnel system more flexible and responsive. Three of those demonstrations began before PACER SHARE:

- Integrated Approach to Pay, Performance Appraisal, and Position Classification for More Effective Operation of Government Organizations (Department of the Navy)
- Alternative Personnel Management System (National Institute of Standards and Technology)
- Airway Science Curriculum (Federal Aviation Administration)

The first of these demonstrations is being conducted at the Naval Ocean Systems Center in San Diego and the Naval Weapons Center at China Lake. Its purpose is to demonstrate whether the effectiveness of federal laboratories can be enhanced by allowing management greater control over personnel functions and expanding the opportunities available to employees. Like PACER SHARE, the project examines the benefits of a simplified classification system and pay banding. However, it does not emphasize organizational productivity, it retains performance ratings, and it provides merit pay to reward individual performance rather than gainsharing to reward collective performance. Also, its participants are largely white collar.

The demonstration by the National Institute of Standards and Technology has much in common with the Navy project. Its goals are to simplify the classification process, make it more understandable, and place more decisionmaking authority with line managers. It establishes pay banding and links salaries to individual performance. It differs from the Navy demonstration by testing such innovations as sabbaticals and compensation comparability with the private sector. Participants are primarily scientists and engineers.

The FAA demonstration was intended to develop alternative qualifications and recruitment sources primarily for agency technical occupations. It thus had little in common with PACER SHARE. It was conducted between 1987 and 1991.

Since PACER SHARE began, the Office of Personnel Management has approved two more demonstration projects. One is an FAA demonstration to test retention allowances covering difficult-to-staff positions at air traffic control facilities in the Chicago, Los Angeles, New York, and Oakland areas. The other is a test of skill-based pay by the Defense Logistics Agency at its Ogden, Utah, depot. A third personnel management demonstration was legislated by Congress. It provides lump-sum relocation bonuses and retention allowances to alleviate severe recruitment and retention problems at the FBI in New York City.

Appendix B

LABOR COST AND OUTPUT DATA BY ALC

This appendix lists the data used in the analysis of cost savings. The labor cost data are for paid labor, including straight-time work hours and overtime, as well as paid time away from work such as sick leave and vacation. The labor cost data (Table B.1) have been inflated/deflated to 1989 dollars; the factor for each month is also listed. These constant-dollar labor costs were used in the empirical analysis. The output data (Table B.2) indicate the total number of issues and receipts, including receipts from off-base, receipts on-base from maintenance, receipts on-base not from maintenance, issues off-base, issues on-base to maintenance, issues on-base not to maintenance, and issues on-base to disposal.

Table B.1
Labor Cost Data

Date	Oklahoma City	Ogden	San Antonio	Sacramento	Warner-Robins	Inflator
Oct-84	4345369	5823888	4690572	4733760	5570535	1.2070
Nov-84	4588011	5709451	4168275	4589779	5258498	1.2060
Dec-84	4314538	5196006	4466611	4328928	5134877	1.2050
Jan-85	4501169	5943227	4880203	4962924	5675761	1.2040
Feb-85	3805943	5271722	4196358	4240077	5010665	1.2030
Mar-85	4408107	5329983	4430781	4426660	5260250	1.2020
Apr-85	4609025	4664947	4703066	4546032	5425699	1.2010
May-85	4866280	4906686	4888241	4874845	5665518	1.2000
Jun-85	4345369	4393762	4497052	4212632	4902015	1.1990
Jul-85	4345369	4941580	5003474	4900361	5730154	1.1980
Aug-85	5307116	4897218	4899181	4779882	5468916	1.1970
Sep-85	4213492	4599857	4889533	4715290	5227638	1.1960
Oct-85	4806687	4458032	4835466	5046612	5866423	1.1950
Nov-85	4478021	4653666	4895636	4782663	5400414	1.1940
Dec-85	4610051	4277123	5395900	4927763	5705740	1.1930
Jan-86	4525966	4641801	5377685	5194160	6261241	1.1920
Feb-86	4749331	4059261	4668943	4514522	4912064	1.1910
Mar-86	4656764	4234276	5023656	4401091	5360395	1.1900
Apr-86	4445092	6431997	5145772	5023330	5618976	1.1849
May-86	4868434	6619656	5036279	5020348	5713024	1.1798
Jun-86	4787468	5060315	4953050	4756865	5569933	1.1748
Jul-86	5015442	5495346	5292626	5172639	5784548	1.1697
Aug-86	4940425	5208320	5041056	4523176	5671352	1.1646
Sep-86	5356418	6116704	5225010	4935918	5882552	1.1595
Oct-86	5384385	5738887	5275407	5063284	6022051	1.1544
Nov-86	5150281	4617604	4621701	4579546	5192726	1.1493
Dec-86	5178368	5228666	5399534	4834631	5733495	1.1443
Jan-87	5135757	5449023	5340908	4995943	5961855	1.1392
Feb-87	4731933	5687411	4837567	4480335	5189232	1.1341
Mar-87	5205126	5644615	5328573	4839190	5587308	1.1290

Table B.1—continued

Date	Oklahoma City	Ogden	San Antonio	Sacramento	Warner-Robins	Inflator
Apr-87	5073879	5797411	5232234	4484506	5971385	1.1212
May-87	5206056	5559731	4903195	4452662	5607269	1.1133
Jun-87	4753365	5105705	5295945	4866529	5706452	1.1055
Jul-87	5195691	6181089	5456312	4864218	5893754	1.0977
Aug-87	4719194	5663109	5027915	4428723	5485581	1.0898
Sep-87	4656401	6414122	5495167	4964346	5891267	1.0820
Oct-87	4905329	4997960	5247758	4768209	5465899	1.0742
Nov-87	4374161	4753766	5145966	4343099	5406269	1.0663
Dec-87	5163472	4399793	5482796	4878112	5959837	1.0585
Jan-88	4232980	5756628	5152993	4526551	5456732	1.0507
Feb-88	4439554	4912797	4538377	4368381	5120472	1.0428
Mar-88	4963071	4633851	5182624	4767601	5385640	1.0350
Apr-88	4954925	4410240	4822880	4190914	5075711	1.0321
May-88	4134670	6269400	4912331	4511229	6044987	1.0292
Jun-88	4696891	4970089	4977901	4699810	5479652	1.0263
Jul-88	4287205	4785052	4758915	4363946	5204482	1.0233
Aug-88	5719049	6114319	5204916	4765667	5376906	1.0204
Sep-88	4645255	6121408	5135580	4784332	5549331	1.0175
Oct-88	5602311	5870580	5149514	4557902	5253875	1.0146
Nov-88	5693635	5121979	4738382	4551290	5499549	1.0117
Dec-88	5858433	5328895	5246719	4561684	5745223	1.0088
Jan-89	6023231	5526039	5845177	4504604	6152774	1.0058
Feb-89	5335694	5186893	5525544	4228695	5295695	1.0029
Mar-89	6850949	5720112	6361490	4861290	6597952	1.0000
Apr-89	5742025	5564971	5311492	4137305	5242104	0.9971
May-89	6435204	6113429	6015753	4531570	6067630	0.9942
Jun-89	6198335	6095293	5726654	4759699	5784120	0.9913
Jul-89	5971908	5957296	5330494	4079258	5740432	0.9883
Aug-89	6446851	5721342	5770699	4629251	6082244	0.9854
Sep-89	6233064	5738348	5515125	4206369	5604447	0.9825
Oct-89	6135041	4995330	5608588	4168378	5810690	0.9796

Table B.1—continued

Date	Oklahoma City	Ogden	San Antonio	Sacramento	Warner-Robins	Inflator
Nov-89	6128111	5125476	5750472	4551945	6252610	0.9767
Dec-89	5880984	5051446	5447228	4554793	5530189	0.9738
Jan-90	6385052	5586928	6056664	4720681	6141700	0.9708
Feb-90	5963713	5102438	5251363	4311429	5300216	0.9679
Mar-90	6313458	5655333	5769808	4551945	6147590	0.9650
Apr-90	6159653	5668975	5659271	4625023	5492077	0.9621
May-90	6526296	6001426	5554481	4961197	5970633	0.9592
Jun-90	5968139	5755179	5652143	4378751	5345326	0.9563
Jul-90	5178039	6233943	5960226	4044795	5423723	0.9533
Aug-90	6241201	6325315	5977532	5245426	5788720	0.9504
Sep-90	.	.	.	.	.	0.9475
Oct-90	6250356	6248204	5628312	4184829	5635144	0.9446
Nov-90	6418910	1939302	5351387	3876616	5261079	0.9417
Dec-90	5949757	3518527	3919331	3704412	6162778	0.9388
Jan-91	6249929	.	5281658	3985420	4463448	0.9358
Feb-91	5747272	.	4822133	3577881	5109191	0.9329
Mar-91	5789318	.	4492999	3696185	5128774	0.9300
Apr-91	6012048	.	5237604	3775008	5224066	0.9271
May-91	6209342	.	5441290	4614223	.	0.9242
Jun-91	5659767	6248204	4776155	3477495	.	0.9213

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Table B.2
Output Data

Date	Oklahoma City	Ogden	San Antonio	Sacramento	Warner-Robins
Oct-84	189539	173156	180579	176157	196547
Nov-84	181642	172683	162343	157354	182155
Dec-84	163396	155024	155481	151960	179442
Jan-85	189386	170798	156780	163575	194008
Feb-85	180063	159354	158043	159796	186101
Mar-85	227940	177137	187852	172913	213005
Apr-85	200467	181335	191274	172440	207790
May-85	209955	179540	180511	166943	207658
Jun-85	190665	144648	160946	156359	176135
Jul-85	202900	157313	178005	164842	182299
Aug-85	216464	141557	181202	169618	204432
Sep-85	194839	182033	164999	156897	184359
Oct-85	205359	192337	191417	165766	205814
Nov-85	193661	173590	175067	151966	183958
Dec-85	193670	171793	168593	149736	181753
Jan-86	201055	183950	174727	156724	189047
Feb-86	188481	168557	205647	147480	182485
Mar-86	207833	187154	190502	185279	190652
Apr-86	205062	193246	189650	185914	188183
May-86	188697	164767	167986	162619	186008
Jun-86	190865	171506	168657	169238	175110
Jul-86	202900	178613	177630	167895	183019
Aug-86	216464	156231	179067	162920	191482
Sep-86	195109	186227	175027	157792	188351
Oct-86	201202	162600	189471	170381	187890
Nov-86	184674	152795	165297	151202	168354
Dec-86	185815	157778	164798	155022	168685
Jan-87	173668	155106	170231	151373	170670
Feb-87	185385	170812	169569	159666	180581

Table B.2—continued

<u>Date</u>	Oklahoma City	Ogden	San Antonio	Sacramento	Warner-Robins
Mar-87	219388	191469	191485	181899	211191
Apr-87	211823	177990	191778	169348	203129
May-87	178203	156354	182334	156223	192059
Jun-87	193533	166239	184045	155453	186882
Jul-87	186806	168517	186833	157572	179566
Aug-87	192555	157335	181490	156230	182901
Sep-87	203842	165798	185649	150811	192426
Oct-87	198503	161152	191638	154393	192099
Nov-87	175003	153074	163139	140744	186152
Dec-87	171594	146166	168732	134379	173587
Jan-88	153500	136468	158926	134638	153559
Feb-88	184626	140821	172694	137272	167961
Mar-88	193147	162598	179352	148318	194059
Apr-88	184451	149607	177723	134998	180907
May-88	169868	143975	167425	130126	167354
Jun-88	174023	130356	154471	125972	159296
Jul-88	170780	130510	140624	118811	155016
Aug-88	195203	163583	170520	145740	173938
Sep-88	181163	177609	162742	124665	175020
Oct-88	193292	150311	168609	135182	163687
Nov-88	185059	146430	158963	118002	168847
Dec-88	187536	136276	172014	125429	163925
Jan-89	197825	162090	185537	136427	198965
Feb-89	180893	139019	178623	131744	169957
Mar-89	209133	170032	213344	149125	171626
Apr-89	189480	162513	197575	139455	173530
May-89	196483	161948	197410	150743	185493
Jun-89	187925	151732	202113	133475	178586
Jul-89	168171	136212	172633	126966	147455
Aug-89	213041	165474	206687	148025	197321

Labor Cost and Output Data by ALC 149

Table B.2—continued

Date	Oklahoma City	Ogden	San Antonio	Sacramento	Warner-Robins
Sep-89	182522	142777	174307	131665	160555
Oct-89	193619	146134	194768	134527	172599
Nov-89	184390	147965	173174	131639	163303
Dec-89	159441	135170	160871	115089	145083
Jan-90	188001	145957	169402	132488	175984
Feb-90	178877	138897	169325	118090	177151
Mar-90	198730	165469	189379	136699	189439
Apr-90	176313	140471	173609	126365	167895
May-90	183509	143565	186320	127627	168855
Jun-90	.	126022	178056	119828	166915
Jul-90	128670	168628	164575	113135	145330
Aug-90	219240	155917	184038	128750	176946
Sep-90	.	.	.	.	.
Oct-90	173506	116484	158005	116668	142175
Nov-90	152897	108795	154099	103963	126930
Dec-90	147649	99678	152806	104018	123954
Jan-91	173476	122137	179124	136297	172625
Feb-91	175087	115992	170341	116672	153142
Mar-91	165328	127486	178502	123244	147959
Apr-91	166090	134866	163539	125607	138526
May-91	153542	126868	171179	117977	142252
Jun-91	136256	118312	160364	110193	135646

Appendix C
SACRAMENTO GAINSHARING

Table C.1 shows the unit cost savings and associated gainshares declared by Sacramento since the initiation of the demonstration.

Table C.1
Gainshare Payments by Sacramento

Quarter and CY	Unit Cost Savings	Employee Gainshare
1 qtr CY88	0	0
2 qtr	0	0
3 qtr	0	\$128.09 ^a
4 qtr	0	0
1qtr CY89	\$527,018	\$163.64
2 qtr	\$1,003,614	\$312.31
3 qtr	\$84,694	\$26.57
4 qtr	0	0
1 qtr CY90	\$187,352	\$59.49
2 qtr	\$312,501	\$102.08
3 qtr	0	\$200.00 ^a
4 qtr	0	0
1 qtr CY91	\$1,288,472	\$473.55
2 qtr	\$517,245	\$191.20

^aPerformance Award.

BIBLIOGRAPHY

Alchian, Armen, and Harold Demsetz, "Production, Information Costs and Economic Organization," *American Economic Review*, Vol. 62, No. 5, December 1972, pp. 777-795.

Ash, R. A., E. L. Levine, and F. Sistunk, "The Role of Jobs and Job Based Methods in Personnel and Human Resources Management," *Research in Personnel and Human Resources Management*, Vol. 2, 1984, p. 261.

Beer, Michael, and Bert Spector, "Human Resources Management: The Integration of Industrial Relations and Organizational Development," *Research in Personnel and Human Resources Management*, Vol. 2, 1984.

Bradley, Keith, and Stephen Hill, "Quality Circles and Managerial Interests," *Industrial Relations*, Vol. 26, No. 1, Winter 1987, pp. 68-82.

Chisholm, Rupert, "Quality of Working Life: Critical Issues for the 80s," *Public Productivity Review*, Vol. 7, No. 1, March 1983, pp. 10-25.

Davis, Louis E., "Job Satisfaction Research: The Post Industrial Era," *Industrial Relations*, Vol. 10, May 1971, pp. 176-193.

Deming, W. E., *Out of the Crisis*, MIT Press, Cambridge, Mass., 1987.

Federal Register, Vol. 45, No. 77, p. 26504, April 18, 1980. Notice: OPM approves demonstration project to experiment with new and different personnel management concepts.

Federal Register, Vol. 48, No. 15, p. 2725, January 21, 1983. *Code of Federal Regulations*, Title 5, Part 470. Rule: OPM to conduct personnel management research and demonstration projects under PL 95-454 provisions.

Federal Register, Vol. 48, No. 137, p. 32490, July 15, 1983. Notice: OPM approves final demonstration project plan for a proposed Airway Science Curriculum, a new personnel management concept.

Federal Register, Vol. 52, No. 191, pp. 37082-37096, October 2, 1987. Notice: OPM approves joint personnel management demonstration project with NBS regarding alternative personnel management system at NBS.

Federal Register, Vol. 52, No. 224, pp. 44782-44810, November 20, 1987. Part III: Office of Personnel Management (Proposed Demonstration Project; PACER SHARE: A Federal Productivity Enhancement Program; Notice of Final Approval).

Federal Register, Vol. 55, No. 62, pp. 12079-12081, March 30, 1990. Office of Personnel Management Demonstration Project (PACER SHARE: A Federal Productivity Enhancement Program; Notice of Amendment of PACER SHARE Demonstration Project Plan).

Frost, Carl, "The Scanlon Plan at Herman Miller, Inc.: Managing and Organization by Innovation," in Robert Zager and Michael P. Rosow (eds.), *The Innovative Organization: Productivity Programs in Action*, Pergamon Press, New York, 1982.

General Accounting Office, *Gainsharing: DOD Efforts Highlight an Effective Tool for Enhancing Federal Productivity* (Briefing report), Report No. GAO/GGD-86-143BR, B-224117, September 1986.

Gruneberg, Michael M., *Understanding Job Satisfaction*, John Wiley and Sons, Ltd., New York, 1979.

Herrick, Neal, "Cooperative Self-Interest: Learning from Joe Scanlon," *Public Productivity Review*, Vol. 6, No. 1-2, March/June 1982, pp. 19-34.

Lawler, Edward, and Susan Mohrman, "Quality Circles after the Fad," *Harvard Business Review*, Vol. 63, No. 1, January/February 1985, pp. 65-71.

Lawler, Edward, and Susan Mohrman, "Quality of Work Life," *Research in Personnel and Human Resources Management*, Vol. 2, 1984.

Lawler, Edward, and David Nacler, "Quality of Work Life: Perspectives and Directions," *Organizational Dynamics*, Vol. 11, No. 3, Winter 1983, pp. 20-30.

Likert, Rensis, *The Human Organization: Its Management and Value*, McGraw-Hill, New York, 1967.

Lindell, M. K., J. T. Walsh, J. A. Drexler, and E. E. Lawler, *Effects of Technology on Experienced Job Characteristics and Job Satisfaction*, Battelle Human Affairs Research Center, Seattle, Wash., July 1980.

Locke, E. A., et al., "The Relative Effectiveness of Four Methods of Motivating Employee Performance," in K. D. Duncan, M. M. Gruneberg, and D. Wallis (eds.), *Changes in Working Life*, John Wiley & Sons, Ltd., New York, 1980, pp. 363-388.

Moe, Terry, "The New Economics of Organization," *American Journal of Political Science*, Vol. 28, No. 4, 1984, pp. 739-777.

Office of Personnel Management, Management Reports I-X, 1984-1987. Status of the Navy Personnel Management Demonstration Project.

Office of Personnel Management, Personnel Systems and Oversight Group, Research and Demonstration Division, *Implementation Report*, PACER SHARE Demonstration Project, Washington D.C., August 1989.

Orvis, Bruce R., James R. Hosek, and Michael G. Mattock, *PACER SHARE Productivity and Personnel Management Demonstration Baseline Evaluation*, RAND, R-3753-FMP, December 1990.

Orvis, Bruce R., James R. Hosek, and Michael G. Mattock, Appendices to *PACER SHARE Productivity and Personnel Management Demonstration Baseline Evaluation*, RAND, N-3146-FMP, December 1990.

Orvis, Bruce R., James R. Hosek, and Michael G. Mattock, *PACER SHARE Productivity and Personnel Management Demonstration: First-Year Evaluation*, RAND, R-3943-FMP, 1991.

Orvis, Bruce R., James R. Hosek, and Michael G. Mattock, *PACER SHARE Productivity and Personnel Management Demonstration: Appendices to First-Year Evaluation*, RAND, N-3257-FMP, 1991.

Orvis, Bruce R., James R. Hosek, and Michael G. Mattock, *PACER SHARE Productivity and Personnel Management Demonstration: Second-Year Evaluation*, RAND, R-4127-FMP, 1992.

Orvis, Bruce R., James R. Hosek, and Michael G. Mattock, *PACER SHARE Productivity and Personnel Management Demonstration: Appendices to Second-Year Evaluation*, RAND, N-3404-FMP, 1991.

Orvis, Bruce R., James R. Hosek, and Michael G. Mattock, *PACER SHARE Productivity and Personnel Management Demonstration: Appendices to Third-Year Evaluation*, RAND, MR-310/1-P&R, 1993.

Patten, Thomas H., Jr., "Individual and Group Incentive Plans," *Pay: Employee Compensation and Incentive Plans*, Free Press, New York, April 1977, pp. 386-437.

Pratt, John, and Richard Zeckhauser, "Principals and Agents: An Overview," *Principals and Agents: The Structure of Business*, Harvard Business School Press, Boston, Mass., 1987.

Power, R., *Guide for the Design and Implementation of Productivity Gain Sharing Programs*, Report No. DOD-5010.31-G, Deputy Assistant Secretary of Defense (Manpower, Installations and Logistics), Washington, D.C., March 1985.

Public Law 95-454, "The Civil Service Reform Act of 1978," *U.S. Code Congressional and Administrative News*, Vol. 1, West Publishing Co., St. Paul, Minn., 1978, pp. 1111-1227.

Roll, David, and Joyce Roll, "The Potential for Application of Quality Circles in the American Public Sector," *Public Productivity Review*, Vol. 7, No. 2, June 1983, pp. 122-142.

Shapiro, Carl, and Joseph Stiglitz, "Equilibrium Unemployment as a Worker Discipline Device," *American Economic Review*, Vol. 74, No. 3, June 1984, pp. 433-444.

Spence, Michael A., "The Economics of Internal Organization: An Introduction," *Bell Journal of Economics*, Vol. 6, No. 1, Spring 1975, pp. 163-172.

Strauss, George, "Industrial Relations: Time of Change," *Industrial Relations*, Vol. 23, No. 1, Winter 1984, pp. 1-15.

Thompson, Phillip, "Quality Circles at Martin Marietta Corporation, Denver Aerospace/Michoud Division," in Zager and Rosow (eds.), *The Innovative Organization: Productivity Programs in Action*, Pergamon Press, New York, 1982.

Walton, M., *The Deming Management Method*, Putnam Publishing Group, New York, 1986.

Walton, Richard E., "Work Innovations in the U.S.," *Harvard Business Review*, July/August 1979, pp. 88-98.

Williamson, Oliver, *Markets and Hierarchies: A Study in the Internal Organizations*, Free Press, New York, 1983.

Williamson, Oliver, "The Organization of Work: A Comparative Institutional Assessment," *Journal of Economic Behavior and Organization*, Vol. 1, No. 1, March 1980, pp. 5-38.

Zager, Robert, and Michael P. Rosow, *The Innovative Organization: Productivity Programs in Action*, Pergamon Press, New York, 1982.

MR-310-P&R